ELECTRICAL REVIEW

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5 MARCH 1954

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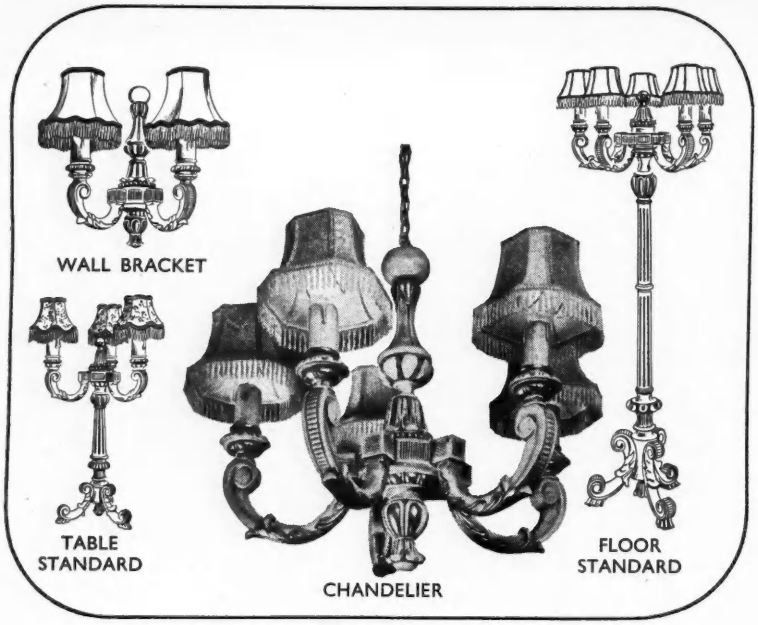

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Expensive Measurement

ABOUT three months ago Mr. S. Howarth, chief meter examiner of the Ministry of Fuel and Power, opened a discussion at a meeting of the I.E.E. Measurements Section on " The Influence of Legislation on the Costs of Metering." He mentioned the law on the subject and said that the cost to industry and the consumer was determined to a great extent by the " manner and degree " of implementation. It was implied that the " manner and degree " were not intensive or extensive until the passing of the 1936 Meters Act, the requirements of which entailed a good deal of expense by way of manufacture, testing and inspection.

Mr. Howarth did not indicate the magnitude of the costs involved but it was suggested in the discussion that the average quarterly domestic electricity bill was £2 and the cost of collection, attributable to legislation, was 7s 6d. Later, a correspondent to the *Electrical Review* questioned this figure, contending that if metering were abolished the saving to the consumer would be only 1s 10d a quarter. This, in turn, was queried by another writer who calculated that the total annual amount attributable to legislation was " something over 10s per consumer."

Some speakers in the I.E.E. discussion favoured less refined metering and it was also suggested that supply should be simplified by charging on a kind of water-rate basis, with certain safeguards. Excessive accuracy was also deplored by Professor G. H. Rawcliffe in *The Times* of 23rd February as representing " a wasteful expenditure of millions of pounds a year." His remedy was a " utility " meter, stable but not otherwise unduly accurate or refined, and a drastic simplification of the whole procedure of testing and certification.

New legislation would be needed for this, of course, and presumably some sort of limit to error would have to be prescribed. How wide a variation could be tolerated? If the error were in the consumer's favour he would naturally say nothing, but let there be a margin of any magnitude against the consumer and there would be plenty of trouble. A recent County Court case has shown that even with a meter found accurate on test an Electricity Board may be unable to collect a disputed account.

We agree that present metering methods are costly and wasteful and think that most consumers would not bother about extreme accuracy if they were told that it would cheapen their electricity. But there is a truculent minority which our legislators are liable to regard as the voice of the people.

ALLOCATION OF RESOURCES

Lord Alexander of Tunis, the Minister of Defence, devoted much of his speech at last week's I.E.E. dinner to showing how dependent the armed forces were upon the electrical profession and industry. In his reply Mr. Harold Bishop, the President of the Institution, spoke of the danger of increased control or guidance of scientific research in the interests of defence. While such action might be essential at present, he said, it must not interfere seriously with industrial research and teaching. There is, of course, another aspect. Military necessity has been a powerful stimulant of research and invention. Aviation, radiolocation, electronics and the development of atomic power have advanced much more rapidly under this pressure than they would have done in time of peace—largely because the funds must always be found for work necessary to national survival. Nevertheless in conditions which are neither peace nor war a satisfactory balance has to be found between the proportions of our limited resources of highly-trained manpower devoted to defence and social advancement.

NUCLEAR POWER FOR THE GRID

In the Clayton Lecture summarized in this issue, Sir Christopher Hinton got down to the engineering features of the various kinds of nuclear reactors designed specifically to produce electricity for the grid and not as a side-line of national defence. His view was that within ten years or so the cost per kWh would fall from the present estimated figure of one penny (which is about 50 per cent above the cost of power from coal-fired stations) to a figure that would make nuclear stations competitive, having regard also to the rising trend in coal prices. The costs of nuclear power will be mainly on account of capital expenditure which should come down materially as experience is gained in physics as well as in engineering construction. Cost, however, is not the only consideration, the chief one being ability to meet the growing demand for electricity.

HYDRO-ELECTRIC COSTS

To spread the high capital charges on its water power schemes the North of Scotland Hydro-Electric Board must simultaneously carry out an intensive programme of electrical development. The success which it has achieved is illustrated by the fact that, despite the sparsely populated character of much of the Highlands, sales in the area have risen from 511 million kWh in 1949 to 811 million kWh last year, the latter figure representing an increase of 12 per cent on 1952. Unfortunately, because of earlier capital restrictions which interfered with the Board's planned programme, little new hydro-electric capacity became available last year and thermal plant (with higher production costs) had to be relied upon to meet much of the additional demand. Overall costs of hydro-electric generation were £1,968,650 (0·517d/kWh), of which interest and redemption charges accounted for £1,824,095 (0·479d/kWh). This compared with £1,197,929 (0·791d/kWh) in the case of steam stations and £432,590 (1·891d/kWh) for diesel plant. The increased use of steam plant meant that the Board had to buy 243,000 tons of coal at a cost of £881,000 against 204,000 tons costing £689,000 in 1952. As a result of the mild weather in December, however, the peak demand in the area was only 9,000 kW (3 per cent) higher than in the preceding year. The Board's report, which is reviewed elsewhere in this issue, shows that there was a net surplus of £14,532 on the year's operations.

ENGINEERING WAGES

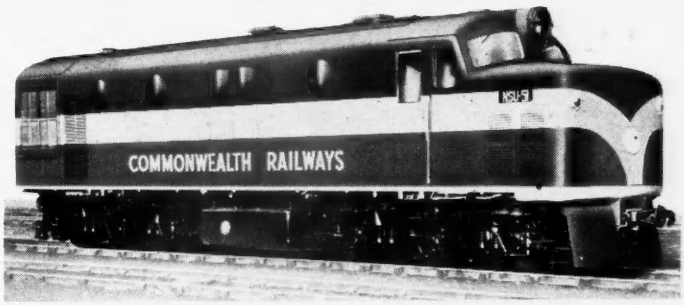
An endeavour to hold the scales evenly between employers and employees is evident in the report of the Court of Inquiry into the engineering wages dispute which was issued last week. The employees' claim was based largely on the contention that it could easily be met from the industry's increased profits. Here the Court came up against the main difficulty inherent in the fixing of wages nationally. It expresses the opinion that while some firms could increase wages without raising their prices it does not follow that all could do so, but on the general ability it is non-committal. Differentiation is possible where payment-by-results systems can be used to reward extra effort. Apparently, however, the Court preferred to gauge the general standard not by average total earnings but by the level of the minimum rate which it considers definitely low as compared with that in other industries. Possible inflationary effects of a wage increase (which might affect the wages of a fifth of the male employed population, directly or indirectly) are studied, somewhat inclusively, and eventually the Court considers that a 5 per cent increase (instead of the 15 per cent claimed) should form the basis of resumed negotiations.

SUPERVISORS' SALARIES

In our last issue we reported the ending of the agreement between the National Federated Electrical Association and the Association of Supervising Electrical Engineers relating to salaries. In an industry like electrical contracting where the units vary considerably in size and, in fact, are usually quite small, the formulation of a satisfactory salary schedule is practically impossible. Most members of the N.F.E.A. do not employ supervisors of A.S.E.E. standing and the agreement has applied to only about 3 per cent of the N.F.E.A. membership. The difficulty which appears to have arisen on the agreement is that the scheduled salaries have been regarded as minima, irrespective of the qualifications or status of the employees concerned.

ELECTRICAL ENGINEERS' EXHIBITION

Next week's *Electrical Review* will contain an illustrated stand-by-stand "preview" of this exhibition which is being held at Earls Court from 16th to 20th March



Diesel-Electric Rail Traction

LOCOMOTIVES FOR COMMONWEALTH RAILWAYS OF AUSTRALIA

To provide new motive power on the 3ft 6in gauge Central and Northern lines of the Commonwealth Railways of Australia, fourteen 62½ ton 955 b.h.p. general-purpose diesel-electric locomotives were ordered from the Birmingham Railway Carriage & Wagon Co., Ltd., as main contractor, with engines and auxiliary equipment supplied by Sulzer Bros. (London), Ltd., and electric transmission and control by Crompton Parkinson, Ltd.

The Central line runs north for 771 miles from Port Augusta to Alice Springs, and has a ruling gradient of 1 in 60 with uncompensated 460ft curves. Sharpest curves in sidings are of 264ft radius. The Northern line runs inland south from Darwin to Birdum, 316 miles, but has much flatter grades. Specified hauling capacity was 202 tons up the 1 in 60 uncompensated grade, but the locomotive has been designed to haul 270 tons.

Because of the continued use of light rails 10·3 tons is the maximum axle load acceptable for diesel units and this figure has been attained without using light alloys in the structural members. Speed is limited strictly to 50 m.p.h.

Atmospheric conditions are severe, for on the Central line temperatures above 100 deg F are prevalent for eight or nine days on end, with a maximum of 118 deg F, along with a humidity of 30 per cent and hot sand-laden winds. The Central line rises to 1,900ft.

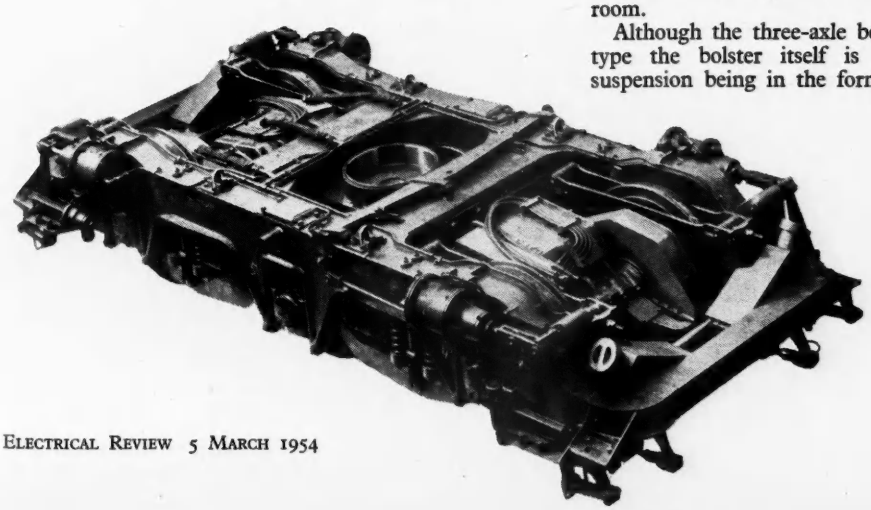
As part of the contract, four spare 4ft 8½in gauge bogies have been built to enable use to be made of at least two of the locomotives on standard-gauge sections of the Commonwealth Railways, including the new Port Augusta-Marree line. When this has been converted to 4ft 8½in gauge all the lines on the southern section will be able to take a 12 ton axle load, and the electrical equipment of the present locomotives is designed for this increased loading at starting.

Welded Construction

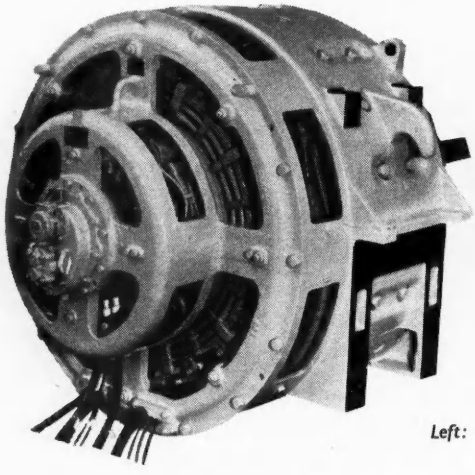
Each locomotive has a completely welded superstructure of steel plate and pressed sections which is riveted to a completely welded underframe. The end buffing load of 100 tons and the weight of the equipment is taken by the underframe without any help from the body framing, and the drag and buffing shocks are taken direct by the main longitudinal members, which are of box section and are used as ducts to distribute the ventilating air from the blower set to the traction motors.

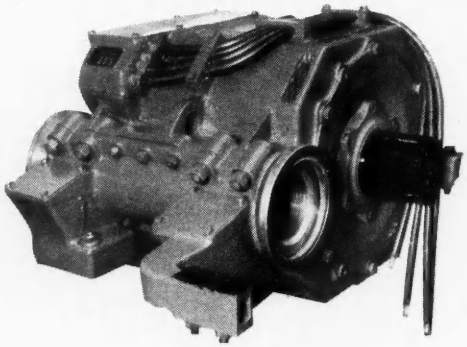
Access to the interior of the superstructure is by a large removable section of the roof through which the complete engine-generator set can be installed and removed. But this section itself has a smaller hatch for the removal of engine cylinder heads, pistons, etc., and there are also smaller hatches through which the traction motor-blower set, the compressor and the main control cubicles can be installed or removed. All hatches and doors are brought up against rubber sealing rings, as are the openable ventilating hatches in cab and engine-room roofs, in order to provide a sealed and pressurized engine room.

Although the three-axle bogies are of the swing-bolster type the bolster itself is not sprung, the complete suspension being in the form of nests of helical springs



General view of two-motor three-axle swing-bolster bogie for the 3ft 6in gauge tracks





Above: One of the four 197 h.p. nose-suspended traction motors

Left: Crompton Parkinson d.c. main generator with recessed auxiliary generator

between the side equalizers and the frame. The springing itself is very soft in order to provide easy riding over the light tracks, and is supplemented by shock absorbers to damp out bounce.

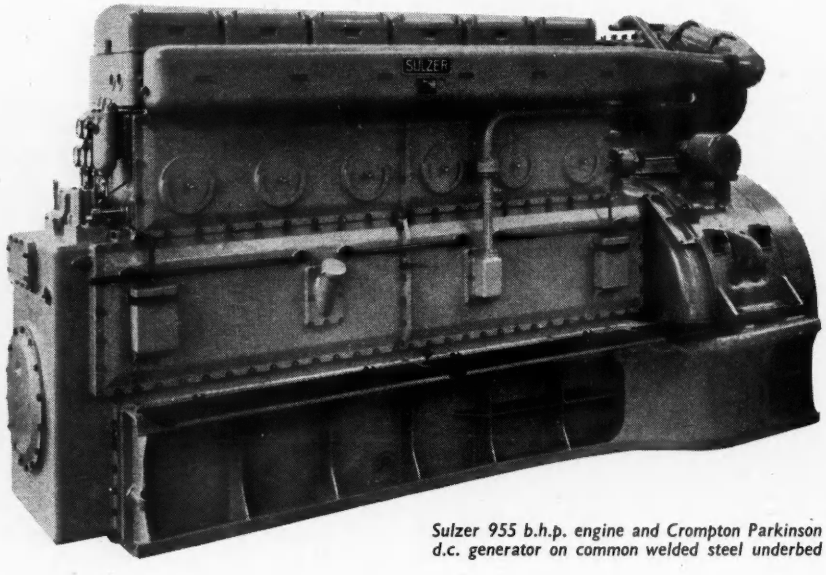
The driving cab is full width, and the driving position is set well back from the front of the locomotive to avoid sleeper flicker and to give maximum protection to the driver. All the essential controls are operated without moving from the seat. They comprise the power controller, reversing key, and engine start-and-stop levers to control two engines; also a " dead man " pedal; combined brake controller for the locomotive and train; instrument panel; lighting switch panel; wheel-slip indicator; sanding valve; recording speedometer; and " pneuphonic " horn. The instrument panel has " black " lighting from an 18in fluorescent tube and Woods filter.

Power is provided by a six-cylinder Sulzer 6LDA28 pressure-charged vertical four-stroke engine. Under conditions in Australia the one-hour rating is 955 b.h.p. at 750 r.p.m. and the continuous output 850 b.h.p. at 700 r.p.m.; under normal European conditions the one-hour output is 1,035 b.h.p. at 750 r.p.m. The dry weight including mounted accessories is about 20,000 lb.

The automatic system of load regulation ensures that the engine operates always under the most favourable conditions according to the load required. The control apparatus is matched to the engine regulator so that the peak tractive effort at one end of the output curve, and a relatively high track speed at the other end, can each be obtained on a low controller notch. Higher notches are used for hauling heavy loads at high speeds or to give high rates of acceleration. There are 18 notches in the controller. With each notch the engine torque and speed are increased. In the first four notches, which are used for starting, the tractive effort is also increased successively, reaching a maximum at notch 5. With this system the driver has only one power controller handle and no separate throttle handle to operate.

With each notch corresponding to a fixed engine torque and speed combination, the engine governor so regulates the generator and traction motor field strengths that the engine cannot be overloaded. Full engine and power protective arrangements are included.

The electric transmission and control equipment has some unusual features of design. The principal elements are the main generator, auxiliary generator, four nose-suspended traction motors, and the control gear arranged in high-voltage and low-voltage cubicles of special dust-proof form.



Sulzer 955 b.h.p. engine and Crompton Parkinson d.c. generator on common welded steel underbed

The main generator is a 10-pole machine with a continuous rating of 535 kW at 700 r.p.m. 535 V 1,000 A. The armatures of the main and auxiliary generators are combined on a common rotor, which is of cast steel bottle form, having great strength with low weight. The coupling for the flange on the oil engine crankshaft is an integral part of this rotor casting. Tandem brushes are used and the brush holders are carried on a revolving rocker with a rack and pinion arrangement allowing the whole to be rotated to give access to all brush holders.

The whole main-auxiliary generator assembly is a single-bearing machine with a parallel roller bearing used

at the outer end. This bearing is carried in a removable cartridge, so that the end shield, and therefore the auxiliary generator magnet frame, does not have to be removed if the bearing should have to be replaced. A feature is a special hand barring gear embodied in the inner end of the main rotor, and giving a simple means of turning over the whole engine-generator assembly. Ventilation of the set is through streamlined passages and only pressurized filtered air is used.

Mounting arrangements include vertical and horizontal faces whereby the main generator frame is attached to the common welded steel underbed, which itself is integral with the oil engine crankcase. The main generator frame also carries the engine exhaust-gas pressure-charger group and the generator field regulator driven from the engine regulator.

The rating of the eight-pole auxiliary generator is 63 kW continuous at 500 to 750 r.p.m. and 110 V 575 A. It is recessed into the main machine and thus reduces the length of the installation, but without sacrificing the accessibility of either machine.

Each of the four traction motors is rated at 197 h.p. 300 A 550 V one-hour, and 165 h.p. 250 A 550 V continuous. The ratio of the single-reduction non-resilient gears is 14 : 65. Bar suspension is employed, with a pivot between the motor frame and the bar itself, and there are helical springs above and below the bar. Motor frame design facilitates inspection, maintenance and also dismantling. Forced ventilation is incorporated, from a motor-blower set in the engine room and comprising a single central motor with a Keith Blackman blower at each end. Each blower supplies air to two motors, one on each bogie.

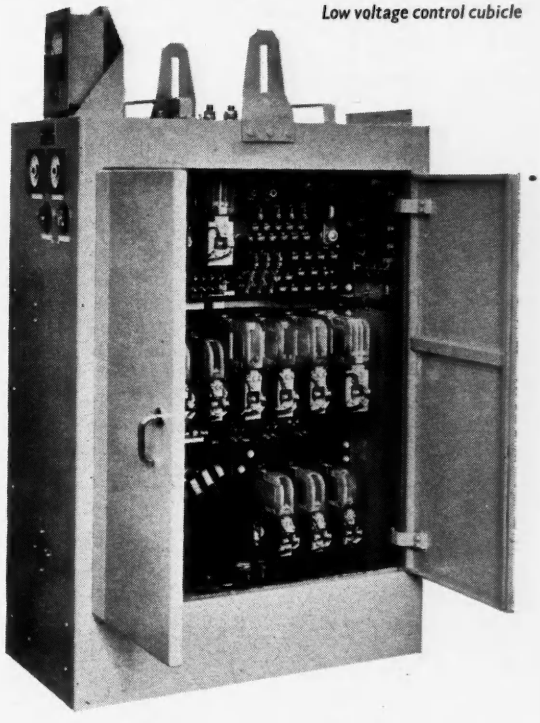
Fine control of engine output and hence of locomotive speed is obtained by the 18-notch controller, as already explained. The four traction motors are in permanent parallel, with field weakening introduced in three stages by electro-magnetic contactors operated automatically when the generator excitation reaches its maximum. Two locomotives can be operated back to back in multiple-unit, and each diesel engine then is separately started and stopped from the leading driver's cab.

The circulating water pump motor and the compressor motor are supplied from the storage battery and can operate with the diesel engine at rest, which would permit the locomotive to coast with the engine stopped, whereas the other motors start automatically on the start of the engine. Like the radiator fan and blower motors, one of the two ventilating fan motors operates at a reduced speed until the fifth power notch of the controller is reached.

The control gear was designed and manufactured by Allen West & Co., Ltd., to Crompton Parkinson requirements. The main control gear is in one cubicle near the main generator, and that for the auxiliary motors is centralized in another cubicle at the opposite end of the engine room. Both cubicles are totally enclosed and are dust-proof, being locked up against rubber sealing rings. The main motor contactor group and the reverser are electro-pneumatically operated, but the weak-field contactors and all auxiliary contactors are of the electro-magnetic type.

In the forward nose of the locomotive superstructure is housed in two sections a 48-cell lead-acid battery of Crompton Parkinson manufacture, of 243 Ah capacity at the five-hour rate of discharge. Side louvred doors give ample ventilation and accessibility for inspection and topping up. Power and control cables, from Crompton Parkinson's Derby works, are run in the duct below one side of the engine room floor and in an arched duct spanning the engine room. The power cables are of the varnished cambric type specially compounded for locomotive service.

Low voltage control cubicle



Acid Dew-Point

INVESTIGATIONS by analytical methods into the determination of acid dew-point temperatures in relation to the corrosion of boiler, economizer and air heater surfaces were described by Messrs. J. R. Rylands and J. R. Jenkinson (E. Green & Sons) in a paper presented yesterday (Thursday) to the Institute of Fuel.

Water dew-point temperature, they stated, was unaffected by the presence of sulphuric acid; acid dew-point they defined as the temperature at which the combustion gases became saturated with sulphuric acid when cooled without change of pressure. The difference between the two lines of approach—condensation and saturation—was important.

After considering examples of unreliability of results obtained by methods of determining acid dew-point that were based on electrical conductivity, the authors demonstrated the existence of two distinct dew-points, that of the acid and that of water in the gases. They had found the temperature range corresponding to the maximum rate of acid condensation to be far more important than the actual acid dew-point temperature, which varied only slightly with wide variations of SO_3 content in combustion gases. The temperature range of acid deposition lay generally between 220 and 280 deg F, outside of which sulphuric acid appeared to remain largely in the gas stream. Best results were obtained by the introduction of super-cooled surfaces into the gas stream slightly before the dew-point position. The mist thus produced lowered the degree of supersaturation, at which the main deposition of acid took place, and thus allowed the combustion gas to pass harmlessly out of the plant. This took place to some extent in boilers which had cooled surfaces in a hot stream and investigations were needed that would give this result by design.

Serious corrosion could also occur due to hydrochloric acid in combustion gases and at temperatures below water dew-point. The view was expressed that corrosion and deposits proceeded rather by chemical action due to acid catalytically formed than by condensed acid alone.

Kettles and Coffee Percolators

IN no electrical appliances do the efficiency, convenience and hygienic qualities of electricity make themselves more apparent than in kettles and coffee percolators. Apart from possessing the advantage of speedier operation, these electrical appliances have the additional attraction of complete cleanliness which permits them, if desired, to be used on the dining table, etc.

From the electrical point of view kettles in general nowadays conform to a more or less standard pattern. Immersion type elements are practically universal, with or without safety cutouts to prevent damage should the kettle be switched on empty or boil dry. The cutouts may be either self-resetting or of the ejector type. One variation is the kettle with the removable element which can be employed for heating other utensils and there are of course whistling models available.

Coffee percolators differ more widely and may either have the heating elements incorporated or in the form of a separate unit. Safety devices are again in widespread use and a number of the models are completely automatic in their operation, embodying devices which permit personal taste selection and keep the coffee hot when it is prepared. Earthenware is being used to a certain extent for the bodies.

In both kettles and coffee percolators it is in appearance that the biggest variation of design occurs and it is largely on "eye appeal" that sales are made, models being available to suit all tastes.

KETTLES

Manufacturer:	Bescol ("Elephant")		Best Products		Bulpitt ("Swan Brand")	
Name or model	207	208	"Fanfare"	"Fanfare"	"Popular" C223a	"Popular" CH223
Capacity	3 pint	3 pint	4 pint	4 pint	3 pint	3 pint
Element	1,500 or 2,000 W immersion with cutout	1,500 or 2,000 W immersion with cutout	1,500 W immersion with cutout	1,500 W immersion with cutout	1,500 W immersion	1,000 W immersion
Body	Polished aluminium	Chromium plated copper	Chromium plated copper	Polished aluminium	Polished copper	Chromium plated
Handle	Black plastic	Black plastic	Bakelite	Bakelite	Metal sides and heat-resisting moulded plastic grip	
Special features	Thermostatic protection	Thermostatic protection	Musical alarm	Musical alarm	—	—
Price	£2 18 0	£3 17 6	£4 15 0	£3 7 6	£3 3 6	£3 8 6

Manufacturer:	Bulpitt ("Swan Brand")					
Name or model	"Popular" CH223a	"Popular" C226	"Popular" CH226	"Popular" A223	"Popular" A223a	"Popular" A224a
Capacity	3 pint	6 pint	6 pint	3 pint	3 pint	4 pint
Element	1,500 W immersion	1,800 W immersion	1,800 W immersion	1,000 W immersion	1,500 W immersion	1,500 W immersion
Body	Chromium plated	Polished copper	Chromium plated	Polished aluminium	Polished aluminium	Polished aluminium
Handle	Metal sides and heat-resisting moulded plastic grip					
Special features	—	—	—	—	—	—
Price	£3 10 6	£3 16 0	£4 5 0	£2 12 6	£2 14 6	£3 0 0

Manufacturer:	Bulpitt ("Swan Brand")					
Name or model	"Popular" A224b	"Popular" A226	"Popular" C223	"Kitchen" 200	"Kitchen" 205	"Kitchen" C200
Capacity	4 pint	6 pint	3 pint	3½ pint	3½ pint	3½ pint
Element	1,800 W immersion	1,800 W immersion	1,000 W immersion	1,000 W immersion	1,500 W immersion	1,000 W immersion
Body	Polished aluminium	Polished aluminium	Polished copper	Brown vitreous enamel	Brown vitreous enamel	Cream and green vitreous enamel
Handle	Metal sides and heat-resisting moulded plastic grip			Vitreous enamel	Vitreous enamel	Vitreous enamel
Special features	—	—	—	—	—	—
Price	£3 2 6	£3 6 0	£3 1 6	£2 12 6	£2 14 6	£2 16 6

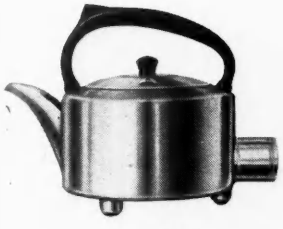
Manufacturer:	Bulpitt ("Swan Brand")					
Name or model	"Kitchen" C205	"Royal" CH102	"Royal" CH103	"Royal" CH103a	"Royal" CH105	Kettle-saucepan CH353
Capacity	3½ pint	2 pint	3 pint	3 pint	5 pint	3 pint
Element	1,500 W immersion	850 W immersion	1,000 W immersion	1,500 W immersion	1,800 W immersion	1,000/125 W immersion
Body	Cream and green vitreous enamel	Chromium plated copper	Chromium plated copper	Chromium plated copper	Chromium plated copper	Chromium plated
Handle	Vitreous enamel	Heat-resisting moulded plastic				Swivel
Special features	—	—	—	—	—	Withdrawable pan
Price	£2 18 6	£3 6 0	£3 12 0	£3 14 0	£4 5 0	£4 17 6

KETTLES . . . . . *continued*

Manufacturer: ..	Bulpitt ("Swan Brand")	H. Cassirer				A. D. Davidson (" Davey ")
Name or model ..	Whistling	777	781	951	950	" Adele " K804
Capacity	4 pint	4 pint	4 pint	4 pint	4 pint	3¼ pint
Element	1,250 W immersion	1,500 W immersion with cutout	1,500 W immersion with cutout	1,500 W immersion with cutout	1,000 W immersion with cutout	1,500 W with cutout
Body	Chromium plated	Aluminium polished	Chromium plated aluminium	Chromium plated copper	Chromium plated copper	Chromium plated copper
Handle	Heat-resisting moulded plastic	Black plastic	Black plastic	Black plastic	Black plastic	Bakelite
Special features ..	Whistle	Streamlined	Streamlined	Streamlined	Streamlined	Novel handle and lid
Price	£5 0 0	£2 14 2	£3 2 6	£3 17 0	£3 15 0	£4 16 0

Manufacturer: ..	Dependable Products	Easipower	Elga Products (" Conquest ")			
Name or model ..	—	—	A5	A10	A15	A20
Capacity	4 pint	4 pint	4 pint	4 pint	4 pint	4 pint
Element	1,500 W immersion with cutout	1,250 W with cutout	1,000 W immersion with cutout	1,500 W immersion with cutout	1,000 W immersion with cutout	1,500 W immersion with cutout
Body	Polished aluminium	Polished aluminium	Polished aluminium	Polished aluminium	Chromium plated copper	Chromium plated copper
Handle	Red or black plastic	Black plastic	Solid black plastic with metal insets			
Special features ..	—	—	Three years' electrical life insurance scheme			
Price	£2 10 0	£2 17 6	£2 17 0	£2 17 0	£3 12 6	£3 12 6

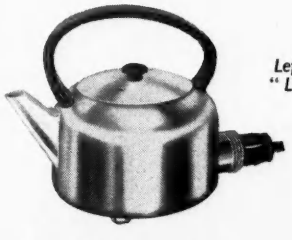
Manufacturer: ..	Eltron			W. T. French (" Mysto ")		
Name or model ..	" Combinax " tea kettle			2002	2003	2004
Capacity	6 cup	6 cup	6 cup	3 pint	3 pint	3 pint
Element	500 W immersion	700 W immersion	1,000 W immersion	1,500 W embedded type with cutout	1,500 W embedded type with cutout	1,500 W embedded type with cutout
Body	Polished aluminium	Polished aluminium	Polished aluminium	Polished aluminium	Polished aluminium	Chromium plated copper
Handle	Black Bakelite	Black Bakelite	Black Bakelite	Black Bakelite	Black Bakelite	Black Bakelite
Special features ..	Element can be removed for heating up extra jug of hot water			—	Whistle	Whistle
Price	£1 8 6	£1 14 0	£2 3 6	£2 16 0	£3 0 0	£3 17 0



Bescol 208

Bulpitt " Royal "

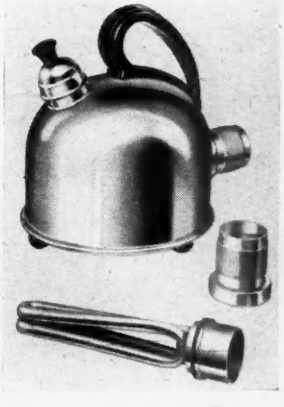
Best " Fanfare " and (right) Bulpitt " Popular "



Left: Cassirer " Lincass " 951

Left: Easipower

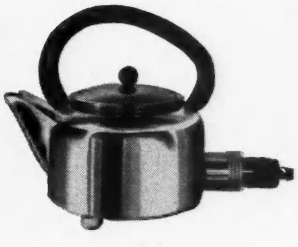
W. T. French 2004 whistling kettle



Below: Davidson " Adele "

Below: Eltron " Combinax "

Below: Elga " Conquest "



KETTLES . . . . . *continued*

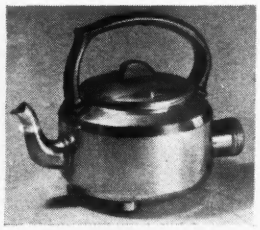
Manufacturer:	F. & F. (" Fortune ")	G.E.C.				Grafton
Name or model	" B "	D.5183	D.5185	D.5353	D.5235	1/53
Capacity	4 pint	3 pint	5 pint	3 pint	5 pint	4 pint
Element	1,250 W with automatic cutout	2,000 W immersion with automatic safety device				1,250 W automatic immersion
Body	Polished aluminium	Polished aluminium	Polished aluminium	Chromium plated copper	Chromium plated copper	Polished aluminium
Handle	Heatproof Bakelite	Polished aluminium and black Bakelite, heat insulated		Chromium plated brass and black Bakelite, heat insulated		Plastic
Special features	—	Super speed boiling				—
Price	£2 15 0	£3 0 0	£3 5 0	£3 19 6	£4 15 0	£2 19 0

Manufacturer:	H.M.V.	L. G. Hawkins			Hotpoint	Metway
Name or model	" Maddox " KJ.3	LGH.700A	" Elizabethan " LGH.555	LGH.666	HK.140	DA499
Capacity	3 pint	4 pint	3½ pint	3½ pint	3 pint	4 pint
Element	1,000 W immersion with cutout	1,250 W auto pre-set with cutout	1,250 W auto pre-set with cutout	1,600 W auto pre-set with cutout	1,500 W " Torribar " with self-resetting cutout	1,500 W plug elector automatic immersion
Body	Chromium plated copper	Polished aluminium	Polished aluminium	Chromium plated copper	Polished aluminium	Polished aluminium with feet
Handle	Black moulded	Bakelite	Bakelite	Bakelite	Black moulded	Black moulded
Special features	Jug type design	—	—	—	Large deep-skirted lid, easy pouring spout, element set low on base	Available for 100/20 V (extra)
Price	£4 7 6	£2 17 6	£3 7 6	£3 19 6	£2 19 6	£2 9 9

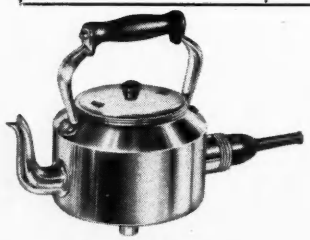
Manufacturer:	Metway		Pearl Industries	Premier		
Name or model	DA466	DA349	" Pearl Super "	" Pylon " 2839	" Pylon " 2839A	" Pylon " 2847
Capacity	4 pint	2 pint	4 pint	3 pint	3 pint	4½ pint
Element	1,000 W non-automatic immersion	750 W non-automatic immersion	Immersion with automatic cutout	1,500 W immersion with cutout	1,000 W immersion with cutout	1,500 W immersion with cutout
Body	Polished aluminium with feet	Polished aluminium with feet	Chromium plated copper	Chromium plated	Chromium plated	Chromium plated
Handle	Black moulded	Black moulded	Plastic	Bakelite	Bakelite	Bakelite
Special features	Available for 100/20 V (extra)		—	—	—	—
Price	£2 6 6	£1 14 9	£4 6 9	£3 17 6	£3 14 6	£4 6 0

Manufacturer:	Premier			
Name or model	" Pylon " 2837	" Pylon " 2837A	" Pylon " 2833	" Pylon " 2833A
Capacity	3 pint	3 pint	3 pint	3 pint
Element	1,500 W immersion with cutout	1,000 W immersion with cutout	1,500 W immersion with cutout	1,000 W immersion with cutout
Body	Copper	Copper	Polished aluminium	Polished aluminium
Handle	Bakelite	Bakelite	Bakelite	Bakelite
Special features	—	—	—	—
Price	£3 12 6	£3 9 6	£2 15 6	£2 12 6

F. & F. " Fortune "

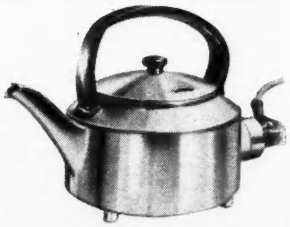


Grafton



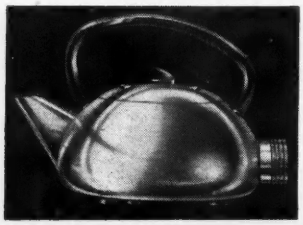
Sun H5544
G.E.C. 3 pint

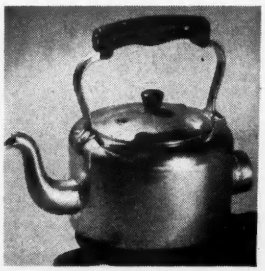
Metway
Hotpoint HK.140



Premier " Pylon " 2839
H.M.V. " Maddox "

L. G. Hawkins LGH.666





KETTLES . . . . . *continued*

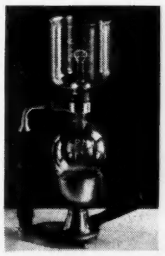
Manufacturer:	Sun Electrical (" Sunco ")		Telsen			
Name or model	H5540	H5544	1120	1121	1122	1123
Capacity	4 pint	4 pint	4 pint	4 pint	4 pint	4 pint
Element	1,250 W immersion with cutout	1,250 W immersion with cutout	1,200 W non-automatic	1,200 W automatic with cutout	1,200 W non-automatic	1,200 W automatic with cutout
Body	Polished aluminium	Polished chromium on aluminium	Polished aluminium	Polished aluminium	Polished aluminium	Polished aluminium
Handle	Polished Bakelite	Polished Bakelite	Upright brackets with Bakelite handle		Streamlined Bakelite	
Special features	Operate on a.c. or d.c.		—	—	—	—
Price	£2 15 0	£3 5 0	£2 10 0	£2 15 0	£2 12 6	£2 17 6

COFFEE PERCOLATORS

Manufacturer:	Best Products	Bulpitt (" Swan Brand ")		H. Cassirer	
Name or model	No. 1	" Mayfair " 480S	" Dorchester " 450S	651	654
Type	Automatic	—	—	—	—
Capacity	2½ pint	1⅔ pint	2 pint	1½ pint	1½ pint
Element	500 W with cutout	400 W immersion with cutout	400 W immersion with cutout	500 W immersion	500 W immersion
Body	Chromium plated copper	Chromium plated	Polished aluminium	Chromium plated with black anodized top and base	
Handle	Bakelite	Heat-resisting moulded plastic	Heat-resisting moulded plastic	Plastic	Plastic
Special features	" Keep hot " safety device	—	—	Earthed connector	Switch connector
Price	£5 17 6	£5 5 0	£3 12 6	£3 18 0	£4 0 0

Cassirer " Lincass " 651

Manufacturer:	Cona			
Name or model	I	II	IIA	III
Type	Table	Table	Table	Table
Capacity	½ pint	1 pint	1½ pint	2 pint
Element	350 W radiant	350 W radiant	350 W radiant	350 W radiant
Body	Chromium	Chromium	Chromium	Chromium
Handle	Black plastic	Black plastic	Black plastic	Black plastic
Special features	Glass coffee maker			
Price	£4 2 6	£4 12 6	£4 17 6	£5 5 0



Cona

Bulpitt " Dorchester "

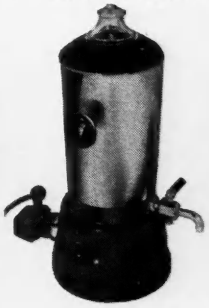
Manufacturer:	A. D. Davidson (" Davey ")		
Name or model	C601	C601A	C618
Type	Urn	Urn	Jug
Capacity	1½ pint	1½ pint	1½ pint
Element	400 W non-automatic	600 W automatic	400 W non-automatic
Body	Chromium plated copper	Chromium plated copper	Chromium plated copper
Handle	Bakelite	Bakelite	Bakelite
Special features	Tap	Tap and automatic device	Attractive shape
Price	£4 10 0	£5 10 0	£4 18 0

Left: Davidson " Davey " C601

Right: Bulpitt " Mayfair "

Below: Elga china " Auto-Perc," F. & F. " Fortune " and Best

Manufacturer:	Elga Products (" Auto-Perc ")	
Name or model	A.30	A.35
Type	Automatic	Automatic
Capacity	1½ pint	1½ pint
Element	560 W automatic	560 W automatic
Body	Chromium plated copper	China with moss rose design
Handle	Black plastic	China moulded
Special features	Makes coffee and keeps it hot automatically. Personal taste selector	
Price	£6 10 0	£5 10 0



COFFEE PERCOLATORS . . . . . *continued*

Manufacturer:	F. & F. (" Fortune ")		G.E.C.	H.M.V.		Hotpoint
Name or model	" De Luxe "	" De Luxe "	D.5371	" Molton," C.P.1	" Claridge," C.P.2	614P1
Type	Urn	Urn	Basket interior	—	—	—
Capacity	2½ pint	2½ pint	1½ pint	1 pint	1 pint	8 cup
Element	450 W immersion	450 W immersion	Mica clamp-on with automatic cutout	300 W nickel chrome on micanite former, with cutout		450 W mica-wound with safety fuse plug
Body	Chromium plated copper	Polished aluminium	Chromium plated copper	Chromium plated copper and brass		Chromium plated copper
Handle	Heatproof Bakelite	Heatproof Bakelite	Black Bakelite, heat insulated	Heat resistant black moulded		Black moulding
Special features	Tap	Tap	Rapid percolation, modern design	Modern design		Easy pouring spout
Price	£4 10 0	£3 15 0	£6 5 0	£4 17 6	£4 17 6	£5 10 0

Manufacturer:	Premier	Russell Hobbs		S.L.R.		Walls
Name or model	652	C.P.1	C.P.U.1	CB6	CB12	435
Type	—	A.c.	A.c./d.c.	Glass	Glass	Separate hotplate
Capacity	1·4 pint	1–2 pint	1–2 pint	1½ pint	2½ pint	2 pint
Element	400 W with cutout	600 W mica sandwich immersion		500 W	500 W	450 W
Body	Chromium plated	Primrose, grey and green porcelain		Heat resisting glass	Heat resisting glass	Chromium plated copper
Handle	Bakelite	Integral moulding with body		Black Bakelite	Black Bakelite	Black plastic
Special features	—	Fully automatic, personal taste selector, 50 W keep-hot element, matching sugar and cream sets		Operation on separate heaters		—
Price	£5 10 0	£3 17 6	£4 4 0	With radiant element: £2 17 6 With solid element: £3 2 6	With radiant element: £3 7 6 With solid element: £3 12 6	£4 10 0

Left: G.E.C.

Right: Premier 652

Left: H.M.V. " Claridge "

Right: Hotpoint

Russell Hobbs

Walls 435

S.L.R. CB6

LIST OF MANUFACTURERS

BESCOL (ELECTRIC), LTD., 118, Parkfield Road, Saltley, Birmingham, 8.
BEST PRODUCTS, LTD., Felix Works, Felixstowe.
BULPITT & SONS, LTD., Icknield Street, Birmingham, 18.
CASSIRER, H., LTD., 31, Pinner Road, Harrow.
CONA, LTD., Feldon Works, Railway Place, Wimbledon, S.W.19.
DAVIDSON, A. D., ELECTRIC CO., 62, Granville St., Birmingham, 1.
DEPENDABLE PRODUCTS, LTD., Team Valley Estate, Gateshead.
EASIPOWER, LTD., 213–215, Gloucester Place, London, N.W.1.
ELGA PRODUCTS, LTD., Railway Place, London, S.W.19.
ELTRON, LTD., Accrington Works, Strathmore Road, Croydon.
F. & F. ELECTRICAL FITTINGS CO., LTD., 33, Alfred Place, London, W.C.1.
FRENCH, W. T., & SON, LTD., Browning Street, Birmingham, 16.
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.
GRAFTON HEATER CO., LTD., 13–15, Westland Place, London, N.1.
H.M.V. HOUSEHOLD APPLIANCES, Hayes, Middlesex.
HAWKINS, L. G., & CO., LTD., 30–35, Drury Lane, London, W.C.2.
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Peterborough.
METWAY ELECTRICAL INDUSTRIES, LTD., Metway Works, King Street, Brighton, 1.
PEARL INDUSTRIES, LTD., Birmingham Factory Centre, Kings Norton, Birmingham.
PREMIER ELECTRIC HEATERS, LTD., Keeley Street, Birmingham, 9.
RUSSELL HOBBS, LTD., 1, Bensham Lane, West Croydon.
S.L.R. ELECTRIC, LTD., 58–60, South Harrow Viaduct, South Harrow.
SUN ELECTRICAL CO., LTD., 118–124, Charing Cross Road, London, W.C.2.
TELSEN ELECTRIC CO. (1935), LTD., Fitzgeorge Street, Manchester, 9.
WALLS, LTD., Palmer Street, Birmingham, 9.

VIEWS on the NEWS

By REFLECTOR

AT any important dinner nowadays it is customary to provide a printed guide to those present, particular attention being paid to the names of the guests. We are told who they are and whom they represent. It is therefore quite unnecessary for the proposer of the toast of the guests to detail them and endeavour to append to each mention a brief biography: not only unnecessary but impossible where there may be as many as forty or fifty people of some eminence. Some are inevitably left out, for where can the line be drawn? It was wise, therefore, of Col. B. H. Leeson, who proposed "The Guests" at last week's I.E.E. dinner, to confine his direct references to the principal guest, Lord Alexander of Tunis, and the responder to the toast, Sir Ian Jacob. He was thus able to do full justice to the guests' chief representatives and I am sure that everybody was satisfied. Col. Leeson has set an excellent precedent.

* * *

When I suggested last week that eventually the British Electricity Authority might become the English Electricity Authority, I said that it would end the present confusion over initials for I could not trace a body with the initials "E.E.A." I did, however, safeguard myself by saying that in these days of alphabetical nomenclature I could not be certain. It is just as well that I did for I have had a letter from Mr. Alun Davies, the chairman of the English Electric Apprentices' Association, informing me that this organization uses the initials E.E.A. I may ask what has happened to the other "A." But Mr. Davies also says that the Association is more commonly known as E^2A. Even this is not mathematically correct; it should surely be E^2A^2 to square it up properly.

* * *

Mr. J. R. Cotterill, M.I.E.E., of West Bromwich, suggests that in my note of 19th February upon the Welsh Nationalist demand for electrical separation from England I was over-generous in giving Wales the Uskmouth power station. Uskmouth is, of course, in Monmouthshire, but I refuse to be drawn into arguments about the nationality of that county. All I did was to quote "Plaid Cymru" which included Uskmouth among a number of Welsh stations. This is probably justified because Uskmouth is in the South Wales Division of the B.E.A.; but so, somebody will point out, is the Lydney (Gloucestershire) station. Let us then beware of creating another Oder-Neisse line.

* * *

One benefit arising from the nationalization of electricity supply in this country is that the consumer is no longer required to pay extra to provide "rate relief." Cape Town customers are still subject to this system and the city electrical engineer there has had to make a mild protest. He mentions that electricity charges have actually had to be raised to provide rate relief and proposes that some limit should be set in this respect. It is certainly inequitable to impose upon electricity users what is in effect extra rating.

* * *

Interesting speculations on future methods of generating electricity appeared in a review of a book in the *Electrical Review* of 1st March, 1884. The possibilities of wind power were discussed and it was mentioned that Coulomb claimed to have produced "an available effect of 7 horse-power from a windmill." Without going into figures, the reviewer said that France and England had done more in developing their water-power resources than any other European countries. Yet, he said, in Great Britain and Ireland 900,000 h.p. was going to waste. Turning to steam, he said that it was almost humiliating to admit that after so many decades of experiments on and improvements to the steam engine seven-eighths of the available power was wasted. As regarded other methods it was said:—"The author speaks of a process by which the dynamic heat generated by the oxidation of petroleum in non-conducting vessels may be utilized." On the prospects of developing solar energy (not in England) the reviewer thought that with a boiler enclosed in a casing of clear glass giving ready passage to the sun's rays but almost entirely preventing the escape of "low tension" heat rays steam might be generated at a useful pressure.

* * *

I was surprised to learn from "Strix" in last Friday's *Spectator* that "the Southern Railway, when it existed as such, had a reputation for being rather backward and old-fashioned." The truth is that before it became the Southern Railway some of its components had that reputation but for years it had been the most progressive of the four sections. For that electrification was the principal reason and the Southern Region remains the most up-to-date; its latest development—the frequency-change and modernization—was described in last week's *Electrical Review*. It remains to be said that in the same issue of the *Spectator* Sir Compton Mackenzie, writing of the earlier railway amalgamations, said that "the Southern Railway, by turning four badly-managed lines into one well-managed one was a success," in contrast with the other groups. But Sir Compton does not appear to have appreciated the extent to which electrification has been responsible.

* * *

Emissions from power station chimneys are also a problem in the United States. The subject of atmospheric pollution was recently discussed at a meeting of the Prime Movers Committee of the Edison Electric Institute when, it is reported by the *Electrical World* (New York), the chairman described meteorological conditions that worsened the "smaze" last November in New York. This form of atmosphere is presumably smoky haze and is probably of a lighter character than "smog"—apart from sounding better.

Load Prospects in Uganda

Utilizing Output from Owen Falls

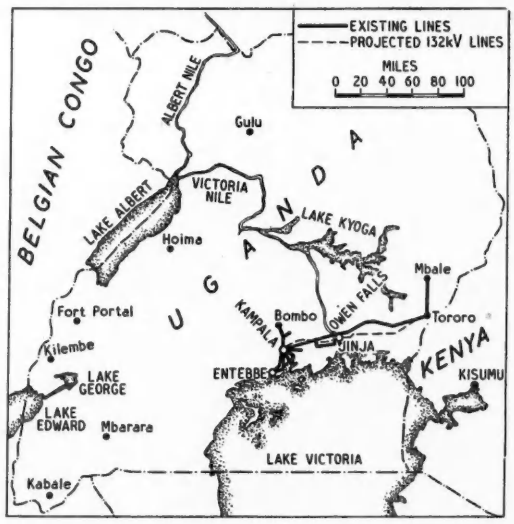
NEXT month the Owen Falls hydro-electric scheme in Uganda is to be officially inaugurated by H.M. the Queen. Already, as reported in the *Electrical Review* of 8th January, the first 15,000 kW turbo-alternator set has been put into operation and the second should be ready shortly. The year just closed therefore marks an important phase in the development of the Uganda Electricity Board which placed the contracts for the project in September, 1949.

In 1948, when the Board was established, the demand in the area was approximately 1,600 kW. Before the opening of the Nile scheme it was desirable that a substantial load should be built up; this had to be met temporarily by thermal plant, of which 15,000 kW was ordered. In a foreword to the Board's sixth annual report just published the chairman, Mr. C. R. Westlake, M.I.E.E., shows that at the end of last year the load had reached 13,000 kW, enabling the hydro-electric station to start with an estimated annual revenue of £700,000. It is anticipated that, with the load already contracted for, the first 90,000 kW of plant for which orders have been placed will be fully utilized. Moreover, the Board expects that by 1962 it will have built up sufficient load to ensure that the Owen Falls plant is self-supporting.

Development Programme

At the end of last year the total number of consumers was 10,400, against 4,143 in 1949. In that period the quantity of electricity generated annually had risen from 10·7 million kWh to 59·5 million kWh; by 1958 the figure is expected to be more than four times as much (242 million kWh) and by 1962 an output of 406 million kWh is anticipated. Sales last year totalled 51·1 million kWh, an increase of more than 50 per cent compared with 1952. Capital development schemes costing £125,000 were approved. At the end of the year 423 miles of high-voltage overhead lines and 130 miles of low-voltage lines were in commission, together with 7·3 miles of h.v. and 10·9 miles of l.v. underground cable. Erection of double circuit 132 kV steel tower lines from Owen Falls to Tororo and Kampala was begun. On the Tororo line 115 out of 380 towers had been erected by the end of December, while on the Kampala line, for which forest clearing was still in progress, 35 out of 230 towers were in position. Owing to a revision of the development plans of Kilembe Mines, Ltd., the proposed erection of a transmission line from Owen Falls to Western Uganda was abandoned.

Up to the end of the year direct expenditure on the Owen Falls project amounted to £7,418,971 and commitments had been entered into for £3,140,000. The estimated cost of nearly £11,000,000 for the scheme (with provision for ten sets and six actually installed) is twice the figure given in the project report. Interest and head office management expenses raise the total to over £13,000,000. The cost of carrying out the Board's whole programme of works as approved in decisions up to 31st December is estimated at £21,441,764. As, however,



a review of the plant position has shown that in the near future it will be necessary to order another 30,000 kW of plant, the capital requirements will be increased to £23,000,000. An important factor in this regard was the agreement for the provision of a bulk supply to Kenya (*Electrical Review*, 20th November, 1953).

Income last year amounted to £555,584 (against £368,514) and there was a trading surplus of £63,405 (£21,927), this being appropriated towards interest on loans. (Had provision been made for the whole of the capital charges attributable to expenditure on fixed assets there would have been a deficiency of £61,000.) In September a surcharge of 25 per cent was imposed on all tariffs other than the lighting flat rate; at the same time meter rents were abolished except in a few special cases. The Board reports that the increased charges have not resulted in any noticeable recession in demand.

Details are given in the report of the progress of work at Owen Falls, mention being made of the difficulties experienced in closing the last temporary gap in the main dam. The water reached 3,697ft above Uganda Standard Datum on 23rd December, permitting the testing of the first set. A permanent housing estate for African employees is to be built on the river bank near the station. To decide the design of new headquarters for the Board in Kampala a competition was arranged, the winner being Mr. E. I Graff of Johannesburg; it is expected that tenders will be invited this year.

LOSSES IN KAPLAN TURBINES

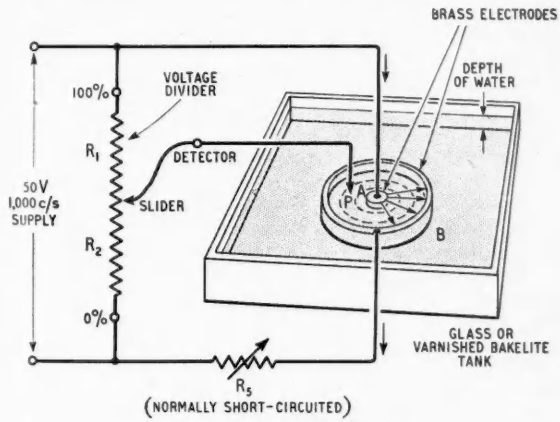
A THEORETICAL scale formula for Kaplan water turbines by Mr. S. P. Hutton (Fluids Mechanics Division) has been published by the Institution of Mechanical Engineers. A survey is made of existing formulæ since 1909 and their merits are compared. The growing use of this type of turbine, especially for low-head river installations, and the difficulty of accurate measurement of full-scale efficiency under working conditions has increased the need for accurate model testing as a basis for acceptance. The Moody formula as used in the U.S.A. overestimated and the Ackeret formula as used on the Continent underestimated full-scale efficiency. At optimum efficiency, it is found that 70 per cent of the losses are frictional and that between 0·5 and 1·5 times normal flow the proportion of runner to total losses may decrease from 90 to 50 per cent.

The Electrolytic Tank

Principle and Applications

QUALITATIVE applications of the electrolytic tank to engineering design problems were discussed in a paper presented on 23rd February by Messrs. H. Diggle and F. R. Hartill (Metropolitan-Vickers) before the Measurements Section of the Institution of Electrical Engineers.

The authors showed the principle underlying the electrolytic tank to be the analogy which existed between four fundamental formulæ, namely: (1) Current = e.m.f. × conductance—in electro-dynamics; (2) magnetic flux = m.m.f. × permeance—in magnetism; (3) electric flux or charge = voltage × capacitance—in electrostatics; and (4) heat flow = temperature difference × thermal conductance—in heat transfer. These formulæ all took the form: flow = (a function of potential V) × k, where k was a constant which depended on the medium and on the geometry of the electrode system. The co-ordinating equation (Laplace), which must be satisfied at any point in the electric, magnetic or particular field under consideration was $\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = 0$. E.m.f. and voltage in (1) and (3) were analogous to m.m.f. and temperature difference in (2) and (4); similarly conductance was analogous to capacitance, permeance and thermal conductance. Thus a solution of any field problem obtained by experiment in the electro-dynamic field in an electrolytic tank would also apply by analogy to geometrically similar systems in the three other fields.



Principle of the electrolytic tank

In the model here illustrated electrodes, representing to scale the boundary conditions of the problem under consideration, were partly immersed in electrolyte in a tank made of insulating material. Two concentric cylinders, A and B, represented a single-core electric cable and its sheath, the electrolyte simulating the insulation. The supply current flowing from the inner to the outer cylinder was analogous to the electric flux, while the conductance of the electrolyte was analogous to the capacitance of the medium. A probe, P, in the liquid was moved until the detector indicated zero, when the potential at P was shown by the position of the moving contact on the voltage divider. Comparison of the relative performances of two designs could be ascertained within about 2 per cent accuracy.

Applications of the electrolytic tank (which enabled experience to be gained at small cost before building equipment) were then described, first in relation to the determination of stresses in insulation, e.g., switchgear, bushings, transformer windings, and with different permittivities and impulse-voltage distribution, and electrostatic shielding. Other problems dealt with were magnetostatic and electromagnetic fields (including ring-type current transformers and coreless reactors) and fluid flow, as for turbine blades. The tank technique was of considerable use in a design office and appeared to offer scope in teaching, particularly electrical machine design.

DISCUSSION

Opening the discussion, Professor E. Bradshaw (College of Technology, Manchester) pointed out that the authors' plotting techniques still called for a specific knowledge as to what was significant. They implied that the clamp on the two-part bushing was the main cause of bad distribution on both upper and lower porcelains, since the capacitance of the clamp was large. At first glance, it would seem that the distribution would be as shown, whether the clamp was there or not. In referring to the proportion of the supply voltage appearing across each model which gave an indication of relative permeance, the authors seemed to imply that the permeance of the two models was in proportion to the voltage across them, whereas it was the reluctances that were in proportion.

Mr. D. McDonald (B.T.H., Rugby) referred to three basic problems in studying the flux distribution in the coreless reactor: the shape of the base of the tank (the authors had employed a hyperbolic profile); how to supply the current-carrying conductors (the authors had adopted the Pierls technique); and how to represent the tank or shield. The authors had represented a partial circumferential shield, possessing unit permeability and infinite conductivity; but more generally how was one to represent metal which had a finite permeability and a finite conductivity?

Perhaps a more fundamental solution to the first question would be to use a method based on a profile yielding the orthogonal trajectories of the direct analogue; experiments on these lines were not complete as yet. A possible solution to the second problem would be to abandon the Pierls system and develop a means of sending equal currents into all the current-carrying conductors without constraining any of their potentials. To solve the final problem of representing the boundary of the reactor, one might represent both permeability and conductivity, the former by modifying the profile of the base of the tank and the latter by a system of discrete sources of current initiated from a system fed from the tank itself.

Mr. M. P. Wax (E.R.A.) said that in investigating wind flow over hills for the selection of sites for wind generators, only in special cases was he able to begin with a two-dimensional section. With an insulating model with large

plain electrodes on opposite sides, the equipotentials were near the surface and tended to be straight. Producing streamlines from an orthogonal system caused inaccuracies. It was proposed to try double probes. One difficulty had been the size of the tank. Another difficulty was that, for accuracy, the probe must be movable. The main point was whether a hill in a plain was better than a gap between hills in the shape of a valley to give a funnel effect.

Mr. E. G. Wright (Ferranti) preferred to spend more time on the plot than the authors suggested. The authors appeared to be satisfied with qualitative inspection of field plots, but this was an unduly limited use of the information. Whether one contact arrangement under oil flashed over before another if both were going to flash over at the test voltage was not very material. The design and application of the electrolytic tank were now sufficiently well developed for solving most practical problems but the relationship between stress and breakdown for power frequency and impulse voltages needed clarification, a contribution towards which had recently been made by W. R. Wilson in America.

Mr. J. R. Read (G.E.C., Witton) said that estimating stresses by taking the gradient of the equipotential called for high accuracy of representation by making full use of planes of symmetry. Reduction of three-dimensional problems to two dimensions often gave a qualitative picture only; closer approximations could be made in many electrostatic problems by simple three-dimensional models, although this assumed uniform permittivity. Wax models were stable but expensive. Wooden models were cheap but tended to warp. A good compromise was to use models fabricated from synthetic resin-bonded paper board.

Dr. K. E. Latimer related his experience some years ago with an electrolytic tank for work on electron optics. The problem was the focusing of a cathode-ray tube; unfortunately great accuracy was needed in one direction but not so much in the other.

Mr. J. H. Marlow emphasized the importance of simplicity. His own company had taken four months to make its first model at great expense. He preferred wax to wood, which tended to split after a time. A possible method would be to cast a large wedge of wax for a three-dimensional model and make grooves with a grouting machine; or the wedge could be cut through and wax poured in afterwards to form the bottom.

Mr. N. Hay (University of Nottingham) said that the University used rubber sheet $\frac{1}{2}$in thick with metal adjusters at the back to set the shape of the boundary to be investigated. The model could be set to any shape within half-an-hour.

Burning Colliery Slurry

Discussion on I.E.E. Supply Section Paper

THE discussion following the I.E.E. Supply Section paper on the transport, preparation and utilization of colliery tailings at the Emile Huchet power station, which was summarized in the *Electrical Review* last week, was opened by Mr. A. R. Cooper (B.E.A.). The most interesting feature, he considered, was the method of transporting fines by water. The authors seemed confident that during a prolonged shut-down the pipeline would not silt up. In plants handling wet material freezing in ancillary apparatus at least might be expected in the winter.

Mr. G. F. Whalley (N.C.B.) said that the preparation plant appeared complex, and one would have thought that centrifugal hydro extractors with vacuum filters would have been adequate, as slurry could be burned with moisture contents of 25 per cent, although not in the equipment described. The drying plant also seemed an added complication, and he asked whether consideration had been given to high temperature milling equipment associated with shaft drying.

The 1 million lb/hour boiler projected was in startling comparison with the only unit operating in Great Britain specifically designed for burning slurry which was rated at 50,000 lb/hour and 400 lb/sq in, although larger plants were being constructed.

Dr. A. A. Taylor (B.E.A.) asked whether pipeline transport would have been considered had the railway facilities been adequate. Were the difficulties in the handling of the coal and the advantages of central drying and filtering so great as to offset the costs of transport by the existing railway lines?

Mr. G. A. Wauchope (Gwynnes Pumps, Ltd.) said that in this country much attention was being given to the transport of even large coal by pipeline. The problems differed from those involved with the fine coal because it had to be considered first whether it would be economical to pass the coal with the water through the pump.

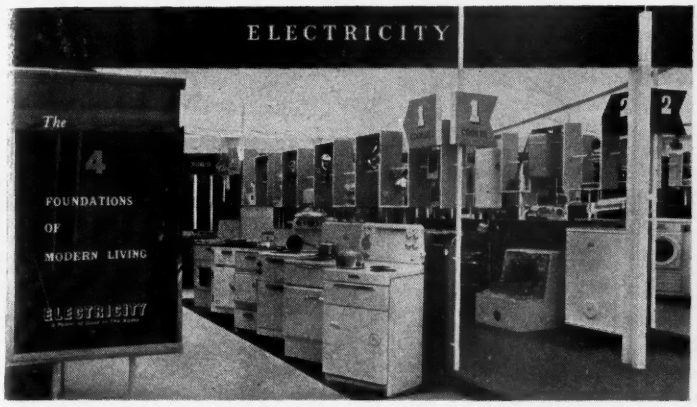
It was important to be able to decide the maximum concentration of solids which could be maintained, as any falling off in concentration meant waste of energy in pumping more water than was necessary.

Mr. F. Dransfield (B.E.A.) said that the acid nature of the water transported indicated sulphur content in the fuel. With steam at about 990 deg F this might lead to difficulties with superheater deposits and corrosion.

Mr. F. J. Hutchinson (Kennedy & Donkin) said that the handling of the dust from the extractor at high level with an induced draught fan indicated apparently that enough of the dust could be got out of the flue gas by a mechanical extractor. Regulations in that part of France seemed less stringent than in this country, where more of the fines would have to be removed.

Mr. N. Dudley said that the transport system could be sectioned: from the face to the central loading points underground, for which no permanent transport system could readily be envisaged; from the loading points to the shaft bottom, which was closely parallel to the case under consideration, provided the problem of transporting all sizes of coal as opposed to fines was solved; the section up the shaft which, again, would have to take coal of all sizes; and transport from the washery to the power station.

Mr. S. C. Brealey and Mr. E. G. White also contributed to the discussion to which Professor R. Gibrat briefly replied.



Ideal Home Exhibition

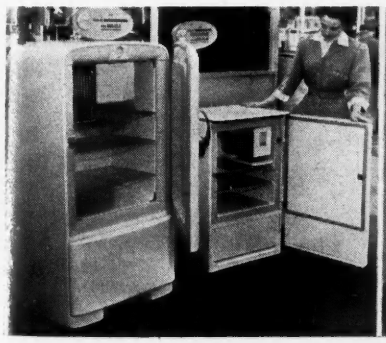
Comprehensive Display of Electrical Appliances

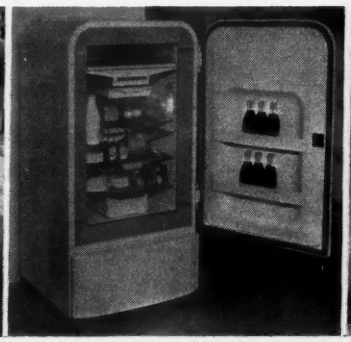
DESPITE the difficulties arising from the electricians' strike the *Daily Mail* Ideal Home Exhibition which was opened on Tuesday at Olympia has lived up to its reputation of being the year's most comprehensive public display of domestic electrical appliances. While practically every type of apparatus is represented, attention is centred particularly on the widespread development of steam irons and the introduction of several new refrigerators and washing machines, as well as on the growth of automatic cooking.

With the lifting of the restrictions on promotional advertising the British Electrical Development Association has taken as the theme of its main displays " The Four Foundations of Modern Living," namely electric cooking, electric water heating, the electric home laundry and electric refrigeration. On four different levels is displayed an extensive selection of appropriate appliances (with particular emphasis on automatic cooking), together with a separate display of smaller appliances such as vacuum cleaners, fires, toasters, kettles, irons, etc. Specialized groupings are devoted to detailed family needs: the family home, the average home and the small home. Here are displayed ranges of " four foundation " equipment, chosen in relation to the requirements of each family group. Also of interest is a model of Daphne Padell's all-electric house which is being described in a serial contribution to the television " About the Home " programme. This is supplemented by large photographs of the appliances in their actual settings in the house.

Probably the greatest number of new products are to be found among refrigerators. Accompanying its new automatic cooker, home laundry equipment, mixer and plate warmer, the English Electric Co., Ltd., introduces two new models, an 8·3 cu ft luxury model with an across-the-top freezer, low temperature " Coldrawer " and door shelves; and a 3·4 cu ft table-top model designed for the small kitchen. Among a full range of G.E.C. household appliances, which include a new super-speed kettle, the $2\frac{1}{2}$ lb " Bride's " iron, a draughtless fan, vacuum cleaners and floor polishers, is a new 3 cu ft refrigerator, features of which are a plastic-on-steel interior, low current consumption, curved front, frozen food storage space, etc. Colour

Above: " The Four Foundations of Modern Living "—electric cookers, water heaters, washers and refrigerators—form the main theme of the E.D.A. exhibit; on the left is a display of cookers and water heaters while on the right is a special exhibit covering the needs of the larger home. Below: Many new refrigerators are shown. Left: The G.E.C. 7 cu ft model with coloured interior and the new 3 cu ft unit. Centre: Electrolux 5 cu ft. Right: English Electric 8·3 cu ft and 3·4 cu ft refrigerators, with an automatic cooker in between





has also been introduced to the interior of the G.E.C. 7 cu ft models, research having shown that its use can aid the eyes by directing the attention to particular areas. The attractive shade chosen is " dawn light " blue. Pale green is available as an alternative to white for the table top of the Easiclene 2 cu ft absorption type refrigerator.

Colour has also been given a good deal of attention on the Frigidaire stand where a special market research exhibit aims at discovering the most popular of ten colours which might be made available for exterior finishes. The models shown in this display are the 4·5 cu ft units, the price of which has this week been reduced from £89 19s to 74 gn. Price reductions are also announced for the company's other two models, the 7·3 cu ft and the 9·5 cu ft, de luxe types of which are also now available.

In addition to its table model Astral Equipment, Ltd., has now a free-standing refrigerator, while a new low-priced table-top unit can be seen on the Nash-Kelvinator stand with a 7 cu ft model equipped with an automatic defrosting device. The Alaska Manufacturing Co., Ltd., shows another table-top design, and the " Cresta " 1½ cu ft refrigerator made by Insulations & Constructions, Ltd., has been joined by 2 cu ft and 4 cu ft models. The new Electrolux 5 cu ft model, the L.500, incorporates a frozen food compartment screened from the main cabinet by translucent doors, suspended plastic drip trays, door shelving, a door lock and interior lighting. In addition to 3, 5 and 7 cu ft refrigerators a representative range of " Prestcold " equipment includes 17 cu ft service cabinets with and without food lockers and the " Prestofreeze Junior " home freezer.

At last year's exhibition British National Electrics, Ltd., held an extremely successful competition which yielded many thousands of entries from people interested in electric cooking. In a similar contest this year competitors have to place in order of importance, among the many advantages of electric cooking, ten selected predominant features. The prizes are a C.49 cooker, a 3 gal water heater and a reflector fire, with a bicycle for the winning boy or girl entrant.

Practically the whole of the Jackson display is devoted to electric cookers, special attention being drawn to the economy, low price, etc., of the latest " Two-Ninety " model. Another specially economical appliance is the L. G. Hawkins " Ovenette," a portable oven particularly useful in flats or for occasions where the full capacity of the normal cooker oven is not required: loaded at 700 W, it reaches its operating temperature in nine minutes. With a full display of cookers, which range from the " Wee Baby Belling " to the " Streamline " cooker with inner glass door and wheeled base, Belling & Co., Ltd., are exhibiting a comprehensive range of electric fires, convectors, clothes drying cabinets, towel airers and bed warmers.

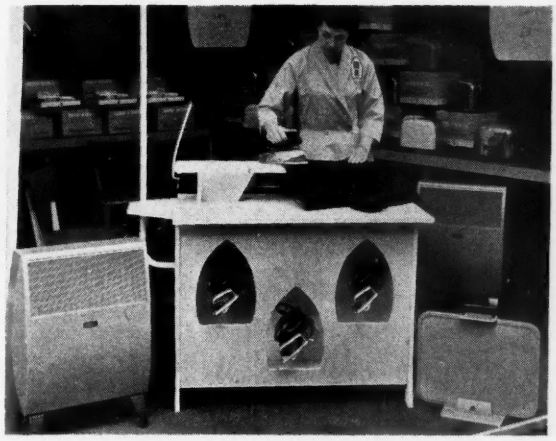
Skarsten paint stripper fitted with a 400 W heating element

Among the Belling fires are three new models: the " Dainty " pressed steel 2 kW firebar type, the " Modern " 2 kW reflector fire and the " Cheery," claimed to be the cheapest imitation coal fire on the market. Panel heaters and convectors include two new Morphy-Richards products. Various " Solectra " fires and convectors are shown by Bratt Colbran, Ltd., and the Dimplex range of oil-filled radiators now comprises ten panel and column models in a wide colour range harmonizing with any interior

Display of Belling fires

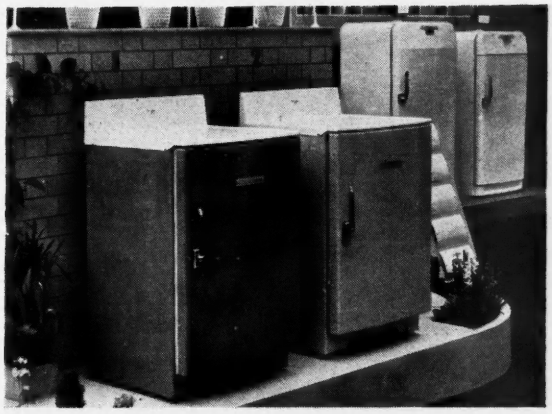
A range of Jackson cookers

Lawnmower fitted with Alpha Machine Tools electric motor conversion drive and hedge trimming attachment



Morphy-Richards steam iron with convector and panel heater

Parnall " Ezy-Press " ironer



Frigidaire 4·5 cu ft refrigerators in colour wth the new de luxe models in the background

decoration scheme. These are available with towel rails. Washing machines are much in evidence, with a growing number incorporating provision for heating the water. In addition to the well-known combined clothes and dish washing machine with its latest " suds-saving " device, Thor Appliances, Ltd., show their new " de luxe " washer with power wringer, pump and heating element, a rotary ironing attachment being available at extra charge. A series of self-contained rooms have been provided for the demonstration of the English Electric heated models, and a heated model of its " Coronation " machine is shown by Ada (Halifax), Ltd. With the latest Wilkins & Mitchell " Servis " heated machine, model S, is a new rotary ironer. Other machines of the latest type are exhibited by Easiclene Porcelain Enamel (1938), Ltd., the British Vacuum Cleaner & Engineering Co., Ltd. (" Goblin "), Bendix Home Appliances, Ltd. (fully automatic), and Burco, Ltd., which also shows a range of wash-boilers. A sink type washer is demonstrated by Carefree Domestic Appliances, Ltd. In addition to showing washing machines Parnall (Yate), Ltd., introduces the " Ezy-Press " plate type ironer, an Australian machine for which the company now has manufacturing rights. Oprim Sales, Ltd., display both domestic and commercial ironers, as well as a rotary dryer.

Among the steam irons introduced is the " Steam-o-matic " made by Kenwood Electrics, Ltd., whose activities have hitherto been confined to making mixers. Weighing only $3\frac{1}{2}$ lb, it is made of non-furring stainless steel. The latest Morphy-Richards heat controlled steam or dry iron sells at only 59s 6d. Another steam or dry iron is to be seen among the Hoover exhibits which also comprise vacuum cleaners (including the new cylindrical model) and floor polishers. Incidentally an interesting feature of the special " Diamonds " exhibit indicates the use of industrial diamonds in high precision work in the Hoover factories. Other floor cleaning and polishing equipment is shown by Electrolux, Ltd., Tellus, Ltd., Vactric, Ltd., the Vacuum Cleaner & Engineering Co., Ltd., and Fillerys (G.B.), Ltd., who claim to make the world's only combined scrubber, vacuum cleaner and floor polisher.

Other items of interest are wire table lamps of contemporary design with fabric shades which can be removed for washing or replacement (Wireworms), an electrically operated built-in wardrobe (Chippendale Workshops), heated mattresses (" Slumberland," seen on . Collier & Sons' stand), an electric paint scraper and also a combined bradawl and screwdriver (Skarsten), and an electric motor conversion drive unit for a lawnmower, with a hedge trimming attachment (Alpha Machine Tools).

The exhibition remains open until 27th March.

Glasgow Supply Failure

A SERIOUS failure of the public electricity supply in the Glasgow area occurred during last week-end, owing to fires at the Dalmarnock power station. This station is the focal point for the supply to the east end of Glasgow. In the station there are two switch houses in both of which is a considerable amount of 20 kV switchgear.

On Saturday night, while maintenance work was going on, a fire broke out in one of the switch houses and this resulted in a partial failure of the station supply to the extent of 45 MW for about four hours. Five men were injured as a result of this accident.

On the next night, Sunday, another fire broke out in the other switch house, resulting in a complete interruption of the station supply. One man was injured. Measures were immediately taken to restore the supply from convenient local grid points, but on Monday morning 110 MW of demand was still to be met.

Another 20 MW of load was restored from the station by Monday night, and on Tuesday morning we learned from the British Electricity Authority that it was hoped to restore another 56 MW by Wednesday morning and to have the whole supply normal by Monday next. No idea of the cause of the accidents could be given by the Authority.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

THE Minister of Fuel and Power has appointed **Major C. L. Baldwin,** M.C., J.P., of Sinnington, near York, to be a part-time member of the North Eastern Electricity Board with effect from 1st March. **Mr. C. I. C. Bosanquet,** a part-time member of the Board since its inception, who is now Rector of King's College, Newcastle-upon-Tyne, and alternate Vice-Chancellor of Durham University, will retire from the Board at his own request on 31st March.

Mr. E. R. Smith, A.M.I.E.E., A.M.I.Mech.E., has been appointed manager of the new Telcon South African cable factory at Wadeville, near Johannesburg, of the Telegraph Construction & Maintenance Co., Ltd., and left London on 25th February on the "Edinburgh Castle" to take up his duties. Mr. Smith commenced his career at the inception of Derby Cables, Ltd., twenty-five years ago. Since then he has held appointments as development engineer with the Liverpool Electric Cable Co., Ltd., assistant works manager to W. T. Glover & Co., Ltd., and latterly with Aerialite, Ltd.

Mr. E. R. Smith

Enfield Cables, Ltd., has announced that **Lord Verulam** has resigned his position as managing director of the company, as at 1st March, at his own wish and in order to devote a proportion of his time to other interests. He will continue as a member of the board, with special responsibility for the company's export business and certain other duties. No new appointment has yet been made to the position of managing director.

On 19th February, Lord Verulam presented long service awards to some 128 staff and employees of **Enfield Cables, Ltd.,** who have given thirty or more years of continuous service to the company. The presentations, which comprised illuminated certificates and appropriate gifts, were made in the canteen at Brimsdown.

Permali, Ltd., has appointed **Mr. R. I. Douglas** as its technical representative (railway engineering). Mr. Douglas, who was previously with the Westinghouse Brake & Signal Co., Ltd., will operate from the company's office at 54, Victoria Street, London, S.W.1, and will be responsible for the sale and development of track circuit insulating joints and other signalling and permanent way equipment produced by the company.

Illness prevented **Mr. W. R. Stevens,** of the G.E.C. Research Laboratories, from reading a paper on street lighting to the Norwegian Lighting Development Society in Oslo last week. His colleague, **Mr. J. M. Waldram,** flew out at short notice in his stead.

Mr. Robert Openshaw has been elected to succeed Mr. J. Tanner as president of the Amalgamated Engineering Union in April. He had a majority of 16,667 votes over Mr. C. Berridge, a Communist.

Mr. T. R. Hawthorn, B.Sc.(Eng.), A.C.G.I., has been appointed resident representative of the General Electric Co., Ltd., in Colombia and will leave for Bogotà on 27th February. Mr. Hawthorn has had extensive experience of Latin America. He joined the G.E.C. in 1948 and spent eighteen years at the company's Witton Engineering Works before taking up an appointment in the Export Department in London.

Mr. F. N. Woods has recently relinquished the duties of superintendent, Lamp and Lighting Department, London, of the Metropolitan-Vickers Electrical Co., Ltd., but remains available for consultation until the end of March. **Mr. S. G. Turner** has been appointed to succeed him as superintendent of the Department, and **Mr. J. J. Berry** has been appointed superintendent, Lamp and Lighting Department, Cardiff.

Mr. Woods has been with the company since 1909 when, following service with a London electrical contractor, he joined the then British Westinghouse Supplies Department office in Norfolk Street, Strand. He has served the company in many varied capacities, being appointed London district superintendent of the new Lamp Sales Department in 1931. He was chairman of the Electrical Trades' Commercial Travellers' Association for 1952-53.

Mr. F. N. Woods

Mr. S. G. Turner

Mr. Turner was educated at Westminster School and, after two years in the B.T.H. Co.'s office at Cardiff, joined the Metropolitan-Vickers sales staff in 1925, serving first with Metro-Vick Supplies, Ltd., and subsequently in the Lamp Sales Department. In 1938 he was appointed illuminating engineer and, in 1943, became lamp superintendent at the Cardiff office.

Mr. Berry joined the company in 1924, having been for some years with Metro-Vick Supplies, Ltd. In 1928 he left to gain further experience with a wholesale distributor. Shortly after rejoining the company in 1934 he transferred to the Manchester office, becoming the Lamp Department representative in North West Lancashire. From 1948 until his new appointment he has concentrated on lamp sales in the centre of Manchester.

Mr. P. J. Daglish, B.Sc., A.M.I.E.E., has been appointed manager of the aircraft equipment division of the English Electric Co., Ltd., at Bradford. He was educated at the Worksop College and King's College, University of Durham, where he studied electrical engineering, and he received his early works training in power station plant and switchgear on the North East Coast.

Mr. P. J. Daglish

Mr. Daglish served during the last war as an engineer officer in the Royal Navy and then joined the English Electric Co., working in the steam turbine division at Rugby, before being appointed manager of the Standards and Specifications Section in 1947. In 1950 he was transferred to the staff of the chief engineer of the company at Stafford, as deputy chief development engineer, and in 1951 he took charge of the co-ordination of the company's development activities between the various product groups.

At the annual general meeting of the Royal Burnham Yacht Club, held on 20th February, last year's vice-commodore, **Mr. N. C. Robertson,** C.M.G., M.B.E., deputy managing director of E. K. Cole, Ltd., was elected

ommodore. The new vice-commodore is **Lord Waleran,** a director of Ekco Electronics, Ltd.

Mr. H. H. Mullens, B.Sc., M.I.E.E., who has been chairman of the North Eastern Electricity Board since 1948, is resigning that position on 31st May to become managing director of A. Reyrolle & Co., Ltd. After his education at Merchant Taylors' School, London, and Armstrong (now King's) College, Newcastle-upon-Tyne, Mr. Mullens was trained at Clarke, Chapman & Co.'s works. In 1924 he joined the North Eastern Electric Supply Co. and remained with that company until the nationalization of the electricity supply industry at which time he was deputy general manager. He has been chairman of the I.E.E. Tees-Side Sub-Centre and a member of the I.E.E. Council. During the 1914-18 war he served in the R.N.A.S. and R.A.F. For some years he held a commission in the Tyne Electrical Engineers.

Mr. H. H. Mullens

Sir Charles Colston, C.B.E., M.C., D.C.M., chairman and managing director of Hoover, Ltd., has announced his intention of retiring from the board after the company's annual meeting. He has been with the company for thirty-five years. His successor as managing director will be **Mr. J. A. Wykes,** assistant managing director, who will take over on 8th April.

Sir Charles Colston recently visited the company's High Wycombe factory, where he was presented with a copy of his portrait subscribed for by the employees which is to be hung in the entrance hall of the factory. The portrait was unveiled by Mr. E. E. Baldwin, who has just been appointed works manager at High Wycombe. Present at the ceremony also were Mr. F. H. Bunn, director and general sales manager, Mr. W. C. Bell, director and chief engineer, Mr. A. G. Colston, technical sales manager, Mr. B. H. Dyson, general works manager, as well as a number of the long service employees.

Mr. E. E. Baldwin has been appointed works manager at the High Wycombe factory of Hoover, Ltd. Before this new appointment Mr. Baldwin was production manager at the company's Cambuslang factory. **Mr. J. C. Shapley,** who has been at High Wycombe on a temporary basis to organize the initial production of the company's steam-or-dry iron there, will be returning to the main factory at Perivale in the capacity of chief production engineer. **Mr. E. Bennett** becomes production manager at the Cambuslang factory and **Mr. J. T. King** takes over the position of production engineer at Cambuslang.

Mr. "Ted" Leather, M.P., was the speaker at last week's luncheon of the **Batti-Wallahs' Society.** His lively discourse dealt with the average Englishman's grumble about politicians and their "interference" in commerce and industry. Mr. Leather maintained that the great majority of Englishmen took little or no active interest in public affairs and until they did they had no right to complain. Mr. T. C. F. Bigland (the "Mate"), in reminding members of the ladies' night on 17th March, asked members to notify him of reservations to assist him in the table planning.

Parnall (Yate), Ltd., announces that **Mr. S. L. Pleasance** and **Mr. H. Thompson** have been elected to the board of directors. Both have been executives of the company for a number of years.

Mr. H. D. Parsons has relinquished his position as associate director of Enfield Cables, Ltd., and took up the appointment of general sales manager of W.T. Henley's Telegraph Works Co., Ltd., on 1st March. After serving in the Honourable Artillery Company in the 1914-18 war Mr. Parsons entered the drawing office of the India Rubber, Gutta Percha & Telegraph Works Co., Ltd. (the Silvertown Company). In 1923 he became a member of the Contract Department staff of Johnson & Phillips, Ltd., and in 1930 was appointed publicity manager, which position he held until 1945 when he joined Enfield Cables. He was appointed an associate director in 1947.

Mr. H. D. Parsons

Mr. A. Calley, M.B.E., has been appointed London branch manager of the London Electric Wire Co. & Smiths, Ltd., and its associates, Frederick Smith & Co., the Liverpool Electric Cable Co., Ltd., and Vactite Wire Co., Ltd. He succeeds **Mr. R. W. Whitley** who has retired.

Successful candidates in the 1953 Industrial Art Bursaries Competition of the **Royal Society of Arts** include Mr. P. Hammond (bursary £150) and Mr. P. D. Durden (bursary £75), both of the Birmingham College of Arts and Crafts, in the domestic electrical appliances section, and Mr. J. C. K. Hardaker (bursary £150) and Mr. B. M. Eccleston (bursary £75), also of the Birmingham College of Arts and Crafts, in the electric light fittings section. In this section Miss P. A. Clifford (Kingston School of Art) received a commendation. An exhibition of winning and commended designs will be held at the Society's House, 6-8, John Adam Street, Adelphi, London, W.C.2, between 19th May and 4th June.

Mr. Leslie B. Marshall, A.M.I.E.E., A.M.I.Struct.E., senior assistant engineer (construction) of the North Western Electricity Board's No. 6 (Lakeland) Sub-Area, has been appointed the No. 6 Sub-Area engineer. He succeeds **Mr. E. F. Westwood,** who has been appointed purchasing officer to the Board. After training with the Electric Construction Co., Ltd., Mr. Marshall joined the Wolverhampton Electricity Department and was subsequently with the Islington undertaking and the North Wales & District Electricity Supply Co., Ltd. In 1933 he was appointed engineer and manager to the Westmorland & District Electricity Supply Co., Ltd., a position he occupied until nationalization.

Mr. L. B. Marshall

A Long Service Association has been inaugurated by **Everett, Edgcumbe & Co., Ltd.,** and to mark the occasion a dinner was given by the directors on 18th February at the "Royal Oak," Edgware. Any employee with twenty-five or more years' service is eligible, and in addition to receiving a gift is also granted extra holidays, according to the number of years spent with the company. Speeches were made at the dinner by Mr. R. E. Everett, managing director, and Group Captain Beresford-Peirse, who both welcomed the formation of the Association. Lord Mount Edgcumbe, the founder of the company, gave an account of the early history of the company.

Mr. F. J. Aldridge has taken over the control of the Cable Test and Research Department of Johnson & Phillips, Ltd., in succession to **Mr. P. M. Hollingsworth,** who is leaving the company to take up another appointment.

Mr. F. J. Aldridge

The annual dinner and staff party of **F. D. Newcombe & Co., Ltd.,** electrical and radio wholesalers, Exeter, was held at the Maer Bay Hotel, Exmouth, on 17th February. To commemorate his twenty-five years' association with the company, Mr. G.S. Mogridge, director and general manager, was presented by the founder of the company, Mr.

F. D. Newcombe, with a gold watch, suitably inscribed.

Mr. S. J. Preston, M.A.(Cantab), A.M.I.E.E., F.C.I.P.A., has now been elected vice-chairman of the Council of the Radio Communication and Electronic Engineering Association. He is one of the chief executives of the Patent Department of Electric & Musical Industries, Ltd.

Mr. S. J. Preston

The **Simplex Electric Co., Ltd.,** has announced the following appointments to its sales staff resulting from a higher degree of specialization between the industrial and domestic sides of its business:— Mr. J. M. Shannon, previously Glasgow depot manager, has been appointed Scottish area manager; Mr. I. M. Cameron, Leeds depot manager, has been appointed North Eastern area manager; Mr. A. Hosken, Birmingham depot manager, becomes Midlands area manager; Mr. R. F. Arnold, Southampton depot manager, will be responsible for industrial sales in the area covered by Southampton, Bristol and Plymouth depots, and Mr. N. Elston, formerly with the Metropolitan-Vickers Electrical Co., Ltd., is appointed Cardiff depot manager in succession to Mr. W. A. Cooper. Additions to the sales staff are also announced.

The annual meeting of the Surrey Branch of the **Electrical Industries Benevolent Association** will be held at Broome Park, Betchworth, Surrey, at 10.30 a.m. on 10th March. Members of the electrical industry are invited to attend.

OBITUARY

Mr. Sidney Harding, head of the Electric Motor Department of Bulpitt & Sons, Ltd., and a director of B.K.B. Electric Motors, Ltd., died on 21st February. He had been associated with Bulpitt & Sons since 1919.

WILLS

Lt. Col. W. A. Vignoles, D.S.O., M.I.E.E., formerly managing director of Evershed & Vignoles, Ltd., who died on 24th October last, left £30,823 gross (£30,520 net).

Mr. R. S. Whipple, M.I.E.E., F.Inst.P., former chairman of the Cambridge Instrument Co., Ltd., who died on 13th December last, left £88,170 gross (£84,025 net).

Mr. L. Pyke, M.I.Mech.E., M.I.E.E., M.I.C.E., consulting engineer of Lucas & Pyke, who died on 8th November last, left £12,719 gross (£12,530 net).

Road Lighting Improvements

THE report on the administration of the Road Fund, covering the year ended 31st March last, states that new or improved systems of street lighting were provided on 77½ miles of trunk roads at a cost of about a quarter of a million pounds, half of which was contributed by the Ministry. These figures are well above those reported in the previour year.

A proposal to have sodium street lighting along the main roads at KINGSWOOD (BRISTOL) has been rejected in favour of fluorescent lamps. The cost of conversion from the present system is estimated at £3,700.

A £46,648 scheme for the conversion of gas lighting to high-pressure mercury vapour is proposed by the BRIGHOUSE Town Council's Street Lighting Committee.

A £5,000 trunk road lighting scheme has been approved by BRIGG U.D.C., subject to Ministry of Transport consent. Some 25 gas lamps will be replaced by about 70 sodium and fluorescent lamps.

ALDERSHOT Corporation is recommended to approve a scheme estimated to cost £3,870 for the provision of improved street lighting in Queen's Road, York Road and Cranmore Lane.

KEIGHLEY Watch Committee has recommended the Finance Committee to approve expenditure of £1,800 on a scheme for improving the lighting of the Oakworth–Keighley road from the Fleece Inn to Oakbank.

SUNNINGDALE Council, Berks, has approved the second stage of a scheme for the conversion of street lighting from gas to electricity at an estimated cost of £1,152.

The Ministry of Transport has approved the JARROW Town Council's £5,000 scheme for installing sodium street lighting in Bede Burn Road and Albert Road.

ASHINGTON U.D.C. has been informed that the cost of improving the lighting of Ashington's main streets will be £5,985.

CRAYFORD U.D.C., Kent, is to seek the approval of the Ministry of Transport to a scheme, estimated to cost £3,958, for improving the lighting of thirteen streets.

DARLINGTON Town Council is seeking sanction to borrow £9,600 for improving the electric lighting on the Great North Road.

HARTLEPOOL Town Council has asked the North Eastern Electricity Board to submit proposals for converting the town's street lighting from gas to electricity.

Huge Water Power Resources

BRITISH COLUMBIA's undeveloped hydro potential is about as large as the total water power now developed in Canada. This was stated recently by Dr. Albert E. Grauer, president of the British Columbia Power Corporation Ltd. He told the Canadian Club of Montreal that the Columbia River in the south-eastern part of the province and in the United States "permits perhaps the world's outstanding hydro development."

It allowed for an eventual installed capacity of close to 50,000,000 h.p., probably more than the whole St. Lawrence system, including its tributaries, the Ottawa, the St. Maurice, the Saguenay, the Bersimis and others not yet investigated. About one-fifth of the electricity capable of being produced on the Columbia would result from benefits accruing to generating stations on the American part of the river from the development of water storage in the Canadian part, he said. The Americans had been very anxious for the storage on the British Columbia side of the border to be developed, but so far they had talked only in terms of paying a lump sum for the perpetual benefits they would receive. British Columbia and the Canadian members of the International Joint Commission insisted on payment in a block of power so that British Columbia would also obtain perpetual benefits.

Dr. Grauer said that the fourth unit at Bridge River, to be ready next autumn, would mark the end of the first stage of power development there and would raise capacity to 248,000 h.p., making it the biggest hydro-electric installation in Western Canada. It was estimated that the remaining power potential in the Bridge River and fringe areas was enough for the next ten years.

Important Canadian Order

A CONTRACT for four hydraulic turbines, believed to have the largest individual output of any turbines of their kind yet built, has been placed by the Quebec Hydro-Electric Commission with the English Electric Co. of Canada, Ltd. They are for the Lac Casse (Bersimis) development on the north shore of the St. Lawrence River.

The Bersimis River will be dammed and the water will flow from an artificial lake some nine miles through a tunnel to an underground power plant. Ultimately the station will house eight units. Each turbine will have a rated output of 150,000 b.h.p. at 277 r.p.m. under a net head of 785ft and will be capable of developing 175,000 b.h.p. under a maximum net head of 875ft.

The basic development and engineering are being done by the Hydraulic Department of the English Electric Co. in England, while the actual manufacture will be carried out in the group's John Inglis plant, Toronto.

ATOMIC ENERGY BILL

Second Reading Debate

SIR DAVID ECCLES, the Minister of Works, in moving the second reading of the Atomic Energy Authority Bill, which sets up the new authority, with ten members, to be presided over by Sir Edwin Plowden, said it looked as if the most important use of atomic energy would be in the generation of electricity. When the prototype power station at Calder Hall had demonstrated its soundness of design the British and Scottish electricity authorities would be free to order reactors of any design. These authorities would buy their fuel from the atomic authority, but apart from that would be free to contract with industry to their own specifications for the construction of atomic power plant.

It was in the Calder Hall family of reactors that the Government saw the earliest prospects of producing economic results. It had been decided to build a vast reactor at Dounreay in Caithness of the type mentioned by the Minister of Supply last year. The enterprise would require a site of 100 acres in open country, near to sources of labour and with amenities. It had to be on the coast because of the discharge of effluent and the provision of sea water for cooling. It also required a large supply of fresh water. Dounreay met all those requirements better than any other site, and the development would help the revival of the Highlands. When it was in full operation the project would provide employment for 600 men, of whom about half would be recruited locally. For safety's sake this plant would be housed in a large spherical steel shell. Even when the plant was in this " Dome of Discovery " there was a very remote possibility of a slight leakage of radioactivity should there be a failure in certain parts of the plant. The local authorities had been consulted and arrangements would be made with their help about what should be done in this most unlikely event.

There was every hope that this vast reactor would show the way to remarkable economies in the consumption of uranium and that it would become a world famous pioneer among the plants providing electricity in the next generation. The survey had already gone on, and construction would start so soon as the Ministry of Works could get under way to the requirements of the Lord President's staff, who were temporarily in charge. A considerable labour force would have to be built up. It would be seen how necessary it was to start now to train the men who were going to design, construct and operate power reactors for the supply of electricity to the public. British engineering firms must also be ready to take the lead in the world's markets, for undoubtedly just over the horizon immense orders were waiting for all kinds of atomic plant. He hoped that this expansion on the industrial side of atomic energy would appear a conclusive argument for an authority outside the Civil Service.

Mr. George Strauss, on behalf of the Opposition, moved the rejection of the Bill. He said that the whole concept of setting up an atomic energy corporation was unwise and in practice would have an effect opposite to that intended by the Government. It would be more likely to retard, rather than advance, atomic development.

In the debate which followed Mr. A. M. F. Palmer maintained that the obvious course for the development of atomic power stations was to go direct to the B.E.A. At the same time the responsibilities of the Minister of Fuel and Power could be enlarged. This would place atomic energy more genuinely on the rails of normal industrial development. Much of the taxpayers' money would probably be saved because there would then be less risk of unremunerative and wasteful expenditure. After years of denouncing public corporations, the Conservatives were now proposing to set up a corporation with no responsibilities of any kind. It would spend, not its own money, but only public money.

The Bill was read a second time by 244 votes to 226.

INDIAN ENGINEERING NEWS

FROM A CORRESPONDENT

UNDER an agreement entered into between the Governments of the United States and India, 200,000 tons of steel will be made available to India as United States assistance for use in India's economic development. The steel acquired under this project will be used mainly in capital development projects in railways, agriculture and major river valley projects. Another agreement under the same Technical Co-operation Plan signed a fortnight before the steel agreement will earmark for India $20 million for the rehabilitation of the railways.

The two agreements still leave $57·1 million in hand out of the total allocation by the United States of $89·6 million for the current financial year. India has so far received $65·45 million aid from America, most of which has gone towards financing the large development projects under the five-year plan.

The Koyna Dam

Work on one of India's biggest power projects began in January when the Chief Minister of Bombay, Mr. Morarjee Desai, laid the foundation stone of the dam which will harness the waters of the river Koyna in Maharashtra, near Bombay, to produce, in its first stage of development, about 230,000 kW of power, most of which will serve the rapidly widening industrial belts round Poona and Bombay cities. As now envisaged, the first stage of the scheme consists of a storage of 36,045 million cu ft of water at a level about 205ft above the river bed. The dam, a masonry gravity structure, will be about 3,000ft long. The water will be carried through a 21ft tunnel about 12,000ft long through the Western Ghats and thence conveyed to underground power units. Details are not yet available, but unless the Konar power station on the Damodar river is completed before the Koyna station, the latter will be the first underground power station in the country. The project, the first of such a magnitude in the Western Ghats, is estimated to cost about £25 million, most of which has been especially granted by the Central Government under the first five-year plan. It is expected to take about six years, after which a start may be made on the second stage which involves raising the height of the dam to 270ft and raising the capacity to 500,000 kW.

INDUSTRIAL NEWS

Electrical Engineers' Exhibition

PREPARATIONS for the third Electrical Engineers' Exhibition are proceeding according to plan and the exhibition will open at Earls Court on Tuesday, 16th March. At a well-attended meeting of exhibitors' representatives held in London last Friday, the strictly impartial attitude of the A.S.E.E.'s exhibition company towards the dispute within the electrical contracting industry was made clear. In response to an inquiry as to their views, the exhibitors, although aware that the prolongation of the dispute might mean that electricity supplies to the stands would not be connected by the opening date, unanimously confirmed the contractual arrangements already made.

E.P.E.A. Claim

As already reported, the Labour Relations Committee of the British Electricity Authority met representatives of the Electrical Power Engineers' Association on 24th February and discussed with them the position of technical staff within the electricity supply industry.

It was finally agreed that the Association would place its case for improved salaries and conditions before the National Joint Board for the industry with a request that a special committee of that body should be formed for the purpose of examining the problems involved.

Electrical Staffs' Salaries

The National Joint Council (Administrative and Clerical Grades) of the Electricity Supply Industry announces increases in the salaries of the general clerical grades ranging from £10 to £20 a year; of higher clerical, administrative and commercial staff—£20 to £30 a year; shorthand-typists, etc., women tracers, telephone operators and assistant (or trainee) demonstrators, £10 to £20 a year. Nursing staffs' salaries and grading are also announced.

Electrical Contracting Dispute

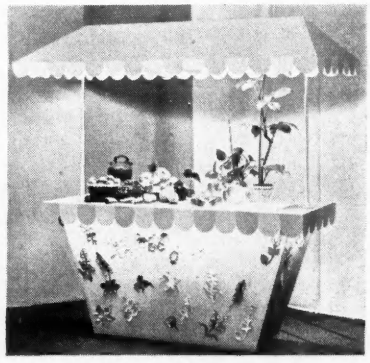
Last week members of the Electrical Trades Union employed at the Coryton (Essex) oil refinery site who had been on strike for five or six weeks returned to work. It was reported that Electrical Installations, Ltd., which had a sub-contract for electrical work at Coryton, had withdrawn from the site and the men had been engaged by the main contractors at a rate of pay 4½d an hour higher than the existing rate.

A statement issued jointly by the Lummus Co., the principal contractors for the project, and the Vacuum Oil Co., said that the agreement ended the six weeks' suspension of work on the electrical equipment of the nearly-completed T.C.C. unit, caused by the strike of some 80 electricians employed by one of the sub-contractors whose contract with the Lummus Co. was terminated by mutual consent three weeks earlier.

The conditions applying on the resumption of work are those which have been agreed between the Lummus Co. and the nine craft unions whose members are engaged on the very limited amount of construction work still to be done by Lummus on this site. Amongst them is the Electrical Trades Union, whose officials and members have accepted the same terms and conditions of employment from 23rd February, as those applying from the same date to such members of the other unions as are employed by Lummus on the construction work.

Lighting Demonstrations

Demonstrations of the new fluorescent lamps were given at the Lighting Service Bureau last week to the non-technical Press. The main demonstration was a domestic set on the lecture theatre stage which was designed to show how the new "de luxe warm white" fluorescent lamp mixes with filament lighting. Novelties included an "ice-cream cart," the table top of which is lit by one 5ft "de luxe" fluorescent lamp from inside the canopy, the lamps lighting the lower



An illuminated "ice-cream cart" at the Lighting Service Bureau

sides being colour-matching. There is also a lighted panel in the flat top surface. The whole display is on wheels. Added to these demonstrations new (high efficiency) warm white lamps were substituted in a number of existing Bureau installations.

V.H.F. Transmitters for B.B.C.

The B.B.C. has placed an order with Standard Telephones & Cables, Ltd., for the latest type of frequency modulated v.h.f. broadcasting transmitters. The order covers twelve 10 kW type C.F.4 and twelve 1 kW type C.F.2 transmitters. At each station, twin transmitters will be used for each programme so that either of them can be switched off without interrupting the service.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £236 0s 0d
Fire Refined 99·70%	ton £235 0s 0d
Fire Refined 99·50%	ton £234 0s 0d
COPPER Tubes ..	lb 2s 3½d
Sheet	ton £290 10s 0d
H.C. wire and strip	ton £261 0s 0d
LEAD, English ..	ton £82 10s 0d
Foreign	ton £81 0s 0d
MERCURY	flask £64 10s 0d
TIN, block (English) ..	ton £685 0s 0d
ZINC, G.O.B. Foreign	ton £71 0s 0d
Electrolytic	ton £79 0s 0d
BRASS Tubes (solid drawn)	lb 1s 10⅜d
Sheet	ton £237 15s 0d
Wire	lb 2s 5½d
PHOSPHOR BRONZE Wire	lb 3s 8⅜d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 16d–16½d

Industrial Electronics Convention

The 1954 Convention of the British Institution of Radio Engineers is being held at Christ Church, University of Oxford, from 8th to 12th July and residential accommodation is being provided in the College. It will be devoted to the application of electronics to industrial controls, processes and computation.

Plant Maintenance

A conference on work study and planning applied to plant maintenance will be held by the Society of Industrial Engineers at Roffey Park, Horsham, from 9th to 11th April. The opening address will be given by a member of the Anglo-American Productivity Team on Plant Maintenance. Further particulars can be obtained from the Society at 28, Victoria Street, London, S.W.1.

Lille International Fair

Brief particulars have been received from the organizers of the Lille International Trade Fair which is being held from 1st to 16th May. It is expected that about 3,500 exhibitors will have displays in the various halls with a floor space of 96,000 sq yd and a site area of 240,000 sq yd. Particulars are obtainable from the Administration, Grand Palais de la Faire, Lille, France.

Disputed Electricity Account

At the Colchester Magistrates' Court on 16th February the Eastern Electricity Board applied for a committal order against Mr. L. S. Lowe, now residing at The Caravan, Green Lane, Great Horkesley. The Board had obtained judgment for £46 in 1949 in respect of an unpaid electricity account; a distress order was made but it was found that the defendant had insufficient goods. Application was therefore being made for his committal to prison.

Mr. R. Proudfoot, who appeared for the Board, said that he was not in a position to tender evidence as to the defendant's means and in the absence of information from the defendant himself he would have to ask for an adjournment.

Mr. Lowe, giving evidence, said that at the first hearing the magistrates adjourned the case because they thought that £46 was too high a charge for 12 weeks' electricity, when the amounts for corresponding periods had been about £4 9s. An examination of his meter proved that it was in order. The Board had offered to accept £10 in settlement and he had agreed provided the supply was reconnected.

He drew attention to the fact that another Court had refused to make an order in similar circumstances because the judge held that meters could be faulty.

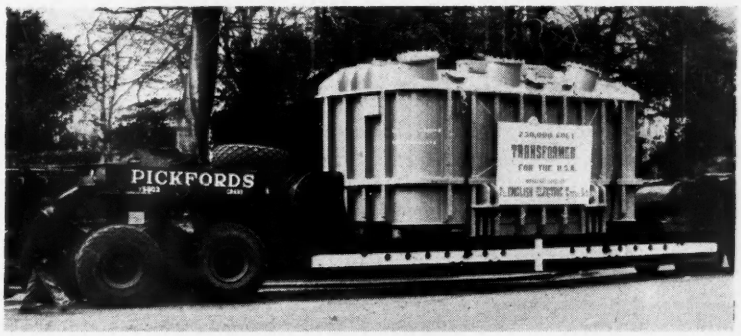
The case was adjourned until 16th March.

Industrial Delegation to Burma

The President of the Board of Trade announced in a written answer in Parliament last week that in agreement with the Burmese Government a delegation of prominent industrialists is to visit Burma this month. The delegation will discuss the Burmese Government's long-term plans for developing the resources of the country, and will consider how British industry can best contribute to them. The members of the delegation will include Lord Burghley, K.C.M.G. (leader), Mr. H. Nimmo, C.B.E., chairman, Southern Electricity Board, and Mr. K. H. Tuson, M.I.Mech.E., M.I.E.E., partner, Mackness & Shipley.

Transformers for the United States

The accompanying picture shows the first big high-voltage transformer to be manufactured in the United Kingdom for service in the United States, leaving Stafford, where it was built by the English Electric Co., Ltd., under a contract with the United States Government Bureau of Reclamation, its destination being the Folsom Dam in California. The transformer is being transported in its own tank, without oil, the tank being filled with nitrogen and sealed. The transport weight is 79 tons. It is an 80 MVA, three-phase unit having auto-connected windings for a voltage ratio of 230/115 kV, and there is a tertiary winding for the supply of 5,000 kVA at 4,160 V. The impulse level applicable to the 230 kV winding is 900 kV and the full series of impulse tests were applied to the completed transformer.



80,000 kVA, 230 kV transformer for the United States, leaving the Stafford Works of the English Electric Co., Ltd.

This is the first of four contracts for transformers for the United States market to be built at the company's Stafford works. The others are two 125 MVA, 230/26 kV transformers for the City of Seattle, three 310 MVA banks of 230 kV generator transformers for the U.S. Army Corps of Engineers for the Chief Joseph Dam on the Columbia River, and one 250 MVA, 230/115 kV bank for the Bonneville Power Administration.

Power Factor Conference

In November last the South Wales Electricity Board organized a conference on power factor improvement methods at Cardiff for its staff and local industrialists. A conference on similar lines is to be held at Swansea on 24th and 25th March for the staff and industrialists in the Board's Western and West Central Sub-Areas. Mr. W. A. Gallon, deputy chairman of the Board, will open the conference and a discussion on power factor will be initiated by Mr. W. P. Warren. There will again be an exhibition of equipment by manufacturers.

Marconi Instruments Expansion

Marconi Instruments, Ltd., St. Albans, has greatly increased the productive capacity of its Longacres works by the opening of a new factory wing. Several sections of the business have been reorganized, and a new design centre provides improved facilities for the company's engineers.

G.W.B. Co.'s Italian Agreement

G.W.B. Furnaces, Ltd., Dudley, Worcs, announces its entry into the field of low-voltage control gear. It has acquired the sole licence to supply and manufacture, for the British Commonwealth, all control gear developed by the firm of Officine Meccaniche Riunite, Milan. G.W.B. now supplies complete panels ready wired and made to specification, also loose contactors, if required, for all purposes. Supplied in a standard range from 10 to 1,400 A a.c. or d.c. the contactors incorporate refinements, such as pivot bearings, and sintered tungsten-silver contact faces giving a life up to twenty times that of conventional copper contacts.

Indian Plastics Industry

A survey of the production of plastics in India appears in *Indian Trade and Industry*. In the course of this it is mentioned that electric lighting fittings and accessories (such as switches, plugs, junction boxes, ceiling roses, adaptors, lampholders, lampshades, etc.) are manufactured in the country.

Production of p.v.c. insulated cables and wires began in 1950 and it is said that the existing capacity is of the order of 8·6 million yards per annum. Actual output in 1950 amounted to 2·8 million yd; in 1951 3·8 million yd; in 1952 about 4·0 million yd; and in the first half of last year 2·3 million yd. It is considered that the present capacity is sufficient to meet the country's demands for these wires and cables.

Strike at Barking

Official recognition was given by the Amalgamated Engineering Union last week to the strike of fitters, boilermakers and others at Barking power station in which a number of its members were involved. The reason for the stoppage is said to have been the upgrading of a fitter's mate to skilled status without the payment of the full skilled rate.

R.A.F. Cookery School

Equipment installed at the new Royal Air Force School of Cookery which was opened on 11th February at the Boy Entrants' Establishment at Cosford, near Wolverhampton, by Air Marshal Sir Victor Groom, includes new " Creda " unit type ranges of the Simplex Electric Co., Ltd. The introduction of cookery brings up to ten the number of R.A.F. trades for boy entrants who are stationed at Cosford. A specially built instructional block includes a number of electrically equipped kitchen classrooms in which

are installed twenty " Creda " ranges, complete with pot racks. These ranges have been installed in groups as ten double oven ranges. A large number of " Creda " grillers are also installed.

Electrical Housecraft

A one-day conference on electrical housecraft is to be held by the Electrical Association for Women in Newcastle on 27th March, following on the success of similar courses attended by teachers in the South-West, the North-West and Yorkshire. It will be held at the Northern Counties' Training College of Cookery and Domestic Science, and is open to all teachers interested in the subject.

E.A.W. Branch Jubilees

The Swansea Branch of the Electrical Association for Women held a silver jubilee dinner on 15th February and the Mid-Gloucestershire Branch held a silver jubilee luncheon the following day. At Swansea Sir John Hacking proposed the toast of the Association to which Dame Caroline Haslett responded. At Gloucester the toast of the Association was given by the Mayor, Alderman A. G. Lea, and the response was made by Dame Caroline Haslett.

Reflector Fires

T. B. Morley & Co., Ltd., Jameson Street, Hull, manufacturers of the " Trent " electric fires (see *Electrical Review*, 12th February, 1954), inform us that it has been found that fires of this name are already being made by another manufacturer, consequently the company has altered the name of its fires to " Derwent."

Works Visit

On 24th February a party of first, second and third year students from the City and Guilds (Engineering) College, South Kensington, London, made a tour of the Derby Works of International Combustion, Ltd., and saw some of the plant destined for power stations of the British Electricity Authority including the station at Drakelow.

Nickel for Electronic Industry

Two new grades of nickel of interest to electronic engineers have recently become available from Henry Wiggin & Co., Ltd., Wiggin Street, Birmingham. The first is " H.P.A. nickel " with a minimum content of 99·5 per cent, available in the form of strip, tape and wire. It is specially recommended for components of valves operating at high temperatures where the evaporation of volatile elements such as magnesium cannot be tolerated. It is also useful for cathodes of valves which must have a very long life while delivering only low emission current.

The second grade, known as " H.P.B. nickel," is intended primarily as a material for cathodes where the sublimation of magnesium cannot be permitted due to very small inter-electrode distances, or where the operating temperature of the cathode is higher than usual and leads to excessive evaporation of magnesium from the cathode. The high silicon content of this material ensures ready activation and good emission. Care must, however, be exercised in the running of valves with " H.P.B." nickel since the high silicon content can result in the build-up of high interface impedances between the cathode sleeve and the coating material under certain conditions.

Telephone Statistics

Since 1st January, 1946, the number of telephones throughout the country has increased by over 2,200,000 bringing the total to 6,121,014 in use at the end of December, 1953. During the year ended 31st March, 1953, the number of effective local telephone calls totalled 3,165 million, and there were 264 million trunk calls. Outgoing calls in the Continental services amounted to 1,484,000 and 79,000 outgoing calls were made on the international radio telephone service.

At the end of December last there were 19,594 telephone circuits over twenty-five miles in length in use in the public network; 1,011 of these had been added during the preceding twelve months. At the end of March there were 5,890 local telephone exchanges throughout the country.

Applications for telephones at the beginning of 1946 were nearly 300,000 and at the end of 1949 outstanding applications had increased to 548,000. Since then it has progressively declined and at the end of December last there were 368,803 outstanding applications for service. New applications are coming in at the rate of 400,000 a year. Over 700,000 subscribers are sharing their exchange lines, and of these over 125,000 are business subscribers.

English Electric Brochure

With the directors' report and accounts for 1953–54, the English Electric Co., Ltd., has issued a well-produced brochure illustrating the many activities of the company.

Automatic Switching Network

The Post Office has recently opened new centres at Aberdeen and Cardiff in an automatic switching network for the speedy transmission of telegrams. This network which, it is estimated, will save about £500,000 a year, will be completed by the end of June. It is based on 22 strategic centres and includes 500 telegraph offices. Sixteen centres are already working, three more will be opened this month and the rest by the end of April.

Each of the telegraph offices in the system will have direct lines to one of the switching centres. Operators at the offices will be able to send telegrams direct to any other office connected to the system by simply dialling the appropriate code number and will then be automatically connected to the distant office.

Human Work in Industry

The fourth annual conference of the Ergonomics Research Society on " The Scientific Study of Human Work in Industry " will be held from 5th to 8th April at Ashorne Hill, near Leamington Spa.

Foster Jubilee Brochure

Foster Transformers, Ltd., recently celebrated the fiftieth year of its foundation and has published a brochure to mark the occasion. This 24-page booklet, which is fully illustrated, outlines the history of the company and describes the range of products now manufactured.

Trade Announcements

Escott Brothers, Ltd., are shortly opening a new Contracting Branch at Harlow New Town, Essex, and ask for catalogues of contracting materials to be sent to Maybank House, 109, Maybank Road, South Woodford, London, E.18 (attention of Mr. T. W. Barrett).

Mr. V. G. Noon has been appointed the Midland representative of **Nettle Accessories, Ltd.,** in succession to Mr. J. C. A. Monkhouse. Mr. Noon was previously with Hoover, Ltd.

Mr. D. L. Isaac has been appointed a representative of **Hellermann, Ltd.**

The " L " type auto washer of **H. Fisher (Oldham), Ltd.,** is now termed " L Mark II " and distributed with improvements and at new prices.

Catalogues and Lists

Electric Meter Co., Castle Circus House, Torquay.—Illustrated catalogue of new and reconditioned electricity meters.

Verrolec, Ltd., 27, Balfour House, Finsbury Pavement, London, E.C.2.—Two illustrated leaflets dealing with the company's reciprocating type electric handsaw and the " Pokorny " pneumatically driven electrode miller.

Siemens Electric Lamps & Supplies, Ltd., 38–39, Upper Thames Street, London, E.C.4.—Two leaflets on infra-red heaters for rearing and fattening piglets (17/53) and for poultry brooders (18/53).

Hotpoint Electric Appliance Co., Ltd., Peterborough.—Four descriptive lists and leaflets on the company's toaster, rotary ironer, washing machine and washing-up machine.

Simmonds Bros., Bedcote Mill, Birmingham Street, Stourbridge, Worcs.—Leaflet describing the company's earth continuity tester for electric tool safety.

High Duty Alloys, Ltd., Slough, Bucks.—Technical booklet introducing " Hiduminium 100 "—a new high temperature material.

Dick's Asbestos & Insulating Co., Ltd., Thames Road, Silvertown, London, E.16.—96-page illustrated catalogue describing a range of asbestos and allied products for many engineering purposes.

A.E.S. Co., Thirsk Road, Easingwold, York.—Illustrated leaflet on a close-limit temperature controller for incubators.

PARLIAMENTARY REPORT

DURING the second reading debate in the House of Commons on the British Transport Commission Bill, Mr. Ernest Davies said he regretted that there was no indication in the Bill of any further measures for the electrification of the North London suburban service. The antiquated lines from Liverpool Street and King's Cross which to-day served Enfield defied description. They reminded one of the "Fanny by Gaslight" era; they were suffering from senile decay. It was gratifying that at long last plans were being drawn up and costs estimated for the building of the new tube from Victoria to Walthamstow, and that there would be a connection with the North London route at Seven Sisters, Tottenham, which would bring about the electrification of these lines. He urged the Ministry once again to consider whether electrification of the North London service might not take place prior to the construction of the tube. Still much needed to be done in the provision of diesel locomotives for the railways.

He was not sure that sufficient safeguards for the public were contained in Clause 28, which gave the Commission power to substitute barriers for gates at public road crossings. Representations had been made that where the lines were electrified there was the possibility that it might be easier for women and children and irresponsible people to get under the lifting barriers on to the live rail. He asked the Minister not to give his consent to the erection of these barriers until he was satisfied that the new form of barrier gave equal protection to the public as that provided by the gate type.

Mr. Black said that in his constituency (Wimbledon) there were two level crossings, and in both cases they were over electrified lines. People locally were very apprehensive of accidents and it was essential that safeguards should be inserted in the Bill.

Mr. Molson, Parliamentary Secretary to the Ministry of Transport, said that before the Minister agreed to the introduction of these barriers anywhere there would be the fullest consultation with the highway authority, and the local authority where it was not the highway authority. Responsibility for investigating applications for these barriers finally rested with the inspecting officers of railways, who could be relied on to ensure that a high standard of public safety was preserved, and that in places where lifting barriers were not suitable—as, for example, in cases where the line had been electrified—permission would not be given.

The Transport Commission was at present exploring the increased use of diesel engines for many purposes, especially for shunting, and in the case of reasonably busy lines, where it was possible to keep the engine running for a great many hours of the day, there was no doubt at all that the diesel engine had very considerable advantages over the steam engine.

The Bill was read a second time.

Marine V.H.F. Communication

Captain Orr asked the Assistant Postmaster General what representations he had made to the United States Government with a view to achieving world standardization on the form of modulation to be used for marine v.h.f. radio communication.

Mr. Gammans said that no representations had been made. The Atlantic City Radio Regulations, an agreement between Governments, provided that frequency modulation should be used by all countries in the Western Hemisphere, and strongly recommended its use in other parts of the world. The Postmaster General subsequently made reservations on this latter point but he had now reopened discussions with Commonwealth and European countries on the adoption of frequency modulation.

Contracts Placed in the U.S.

Mr. Grimond asked the President of the Board of Trade if he could give the value of contracts placed with British manufacturers in the last year for the supply of equipment to electrical schemes in the United States of America; and the value of the tenders which were rejected although the lowest submitted.

Mr. Heathcoat Amory, Minister of State, Board of Trade, said that according to his information, which might be incomplete, British firms secured contracts during 1953 worth about $6,900,000 for the supply of equipment for electrical schemes in the United States. He was aware of two cases where fully compliant British bids, although the lowest, were rejected. One of these was the tender of approximately $4·4 million for four generators for the Chief Joseph Dam where all bids were rejected. In the other case a low British bid of approximately $375,000 to supply a transformer to the City of Los Angeles was rejected on the grounds that evaluation of competing bids showed that no price advantage would be gained by acceptance of the British bid.

Rural Development in Wales

Mr. Gower asked the Minister of Agriculture what was the proportion of electrical development in the rural areas of Wales, compared with the remainder of Britain, during the financial year 1953–54.

Sir Thomas Dugdale said that the number of farms given an electricity supply for the first time during 1953 was 2,001 in Wales and Monmouth, and 10,202 supplied by Area Electricity Boards elsewhere.

Amalgamation of B.E.A. Divisions

Mr. Gower asked the Minister of Fuel and Power if he would take steps to ensure that the North Western Electricity Division should not be amalgamated with the Merseyside and North Wales Electricity Division until there had been some opportunity for Welsh opinion to be ascertained and for Welsh organizations, authorities and industries to be consulted. Mr. Cledwyn Hughes put a similar question but referred to the amalgamation of the "Boards."

Mr. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, said that there had been no proposal to amalgamate the North Western Electricity Board with the Merseyside and North Wales Electricity Board. The British Electricity Authority had recently announced that its corresponding Generation Divisions were to be amalgamated from 1st April; this would in no way affect the supplies of electricity to customers of either of the two Boards.

Transmission Lines Across Farm

Mr. Niall Macpherson asked the Minister of Fuel and Power what were the grounds for his refusal to publish the report of the presiding officer at the inquiry held at the instance of the occupier of Aitchison's Bank, Gretna, into the application of the B.E.A. for a wayleave to carry transmission lines across his farm in a particular manner.

Mr. Joynson-Hicks said that the wayleave was granted by an administrative decision for which the Minister was wholly responsible, and it would not be proper to publish the confidential report made to him by the Inspector who had held the inquiry.

Rights of Entry

In the House of Lords the Rights of Entry (Gas & Electricity Boards) Bill was read a second time.

Trolley-buses for Cardiff

Cardiff Transport Committee reports the receipt from the Ministry of Transport of consent to borrow £128,447 for the purchase of trolley-buses (£85,772), electrical equipment for overhead lines (£19,400) and laying cables (£23,275) for the Ely trolley-bus service.

Electrical Engineering and Defence

Speeches at the I.E.E. Annual Dinner

THE annual dinner of the Institution of Electrical Engineers, at which there was a record attendance of over 1,300 members and guests, was held at Grosvenor House, London, on 25th February.

Field Marshal Earl Alexander of Tunis, Minister of Defence, who proposed the toast of the Institution, offered his congratulations on the fact that the membership had nearly doubled in the last fifteen years. Many of the members, he said, were connected with the electrical manufacturing industry, whose exports during the last two years had reached a value of over £210 million. He hoped that the industry would not confine its attention to traditional markets, but would give special attention to Canada where there was a growing market for heavy electrical plant.

Diverse Electrical Applications

Dealing with the ever-increasing importance of electrical engineering to the Armed Forces, he remarked that in the ships of the Royal Navy every imaginable use of electricity was to be found, from radar to razors. They were as dependent on electricity as a motor car was on petrol. In the new aircraft carrier *Ark Royal* there were 750 miles of cable and nearly half a million electrical connections. In the matter of education and training for the new electrical branch of the Navy the Institution had given invaluable assistance.

In the Army, one example of the use of electricity was that which had made the "Centurion" tank one of the best, if not the best, in the world to-day; it took the form of an electrical-mechanical system which, when once a gun had been laid on the target, held it there no matter how rough the ground and enabled rapid and accurate fire to be maintained. In the air, the applications of electricity would take far too long to detail, but some idea of their importance was afforded by the fact that the larger types of aircraft carried up to 19 miles of wiring and two tons of electrical equipment.

In view of the increasing complexity of modern weapons, he emphasized the importance of keeping the "knobs and handles" as simple as possible, because the more complicated they were the longer it took to train men to operate them, a fact of particular importance in time of war.

The President (Mr. Harold Bishop), who responded, said that Lord Alexander, as a great soldier and a great administrator, would agree that the electrical engineer had a highly important role to play in research into and the design and manufacture of equipment for the defence of the country. At times, however, engineers wondered whether all the Fighting Services fully appreciated the educational and practical training levels in electrical engineering which were necessary for the efficient operation and maintenance of this equipment. There must be even closer collaboration than at present between the fighting man and the engineer if the equipment was to be used in the best interests of this country.

The Government was faced with technical problems of ever-increasing complexity. Unless its decisions were based on sound technical and industrial data, with a minimum of political flavour, there would be inefficiency and perhaps confusion. To a profession such as theirs there seemed to be grave dangers of increasing control or guidance of scientific research in the interests of defence. Action of that sort might be essential now, but it must interfere seriously not only with industrial research but with teaching.

There was outstanding collaboration between the three engineering institutions on questions of education and training as well as on other matters. For some time they had been discussing with the Minister of Education and her officers plans for the development of technological education, with particular reference to the education and training of the young engineer. Concurrently, discussions had been going on with the Advisory Council for Education in Industry and Commerce. It was hoped that the plan which the three institutions had now developed would commend itself to all the interested parties and would have a material effect on the supply of fully-trained young men. They had also to consider whether the curriculum forced engineers into a too restricted field of interest. He was sure that too much specialization was wrong, and it was for that reason that many people disliked the idea of a technological university.

It was clear that more attention must be paid to persuading sixth-form boys to enter the profession, and he sometimes wondered whether engineering received sufficient support from headmasters. Some better method must be found to match more accurately the number of young men wanting to become engineers to the needs, and he hoped that employers and the Institution could devise a more realistic approach to this problem.

Importance of Research

Their profession would expand largely by virtue of research, a glamorous activity which might be defined as "the process of finding out what you are going to do when you cannot keep on doing what you are doing now." Those who had studied how what was called "project research" was conducted in certain universities and technical colleges abroad saw danger if similar methods were adopted here, because they would tend to prejudice teaching. Different national conditions led to different objectives in engineering training, and this country had adopted the best way to meet its requirements.

It was a national duty to increase the export trade by which the country lived, and the second duty of the Institution was to improve the usefulness of the engineer to the community. The Institution played an important part in both these tasks. "Life is becoming increasingly complex," Mr. Bishop said, "and I suppose that we as engineers have helped to make it that way. It is high time that we learned better how to live with our inventions and with each other. We cannot afford to fail in this matter unless we want to invite chaos."

Colonel B. H. Leeson, immediate past-president, who proposed the toast of the guests, said that Lord Alexander's interest in electrical engineering must have been stimulated by the present given to Lady Alexander in Canada of a complete kitchen equipment, which, being modern, was naturally a complete electrical equipment. They would like him to have all the electricity he wanted and felt sure he would not take it on the peak, because he would

appreciate what happened at general headquarters when the load was heavy.

The training of an engineer developed that clear vision, that calculating mind and that constructive policy which were so needed in "top-notch" administrators, and Sir Ian Jacob, the Director-General of the B.B.C., was an illustration of that fact.

General Sir Ian Jacob, in responding, expressed sympathy with the people who had to write about television in the newspapers, for they were obviously not enjoying it at all. He had read in a recent article that last January the percentage of those who had their sets switched on was 46·4. It was no doubt pretty deplorable that three million set owners switched on their sets for the whole of every other night, but from what point of view was it deplorable? After all, there were other pursuits in life. Last year over a million people bought not only television sets but television licences. It would appear from what the critics said that a large part of the population spent the whole of every other night watching television and not liking what they saw. He declined to believe that the people of this island were morons, and if they switched on every other night it could only be because they found something worth watching.

Nuclear Power

AS the subject of the James Clayton Lecture, which was delivered on 26th February at the Institution of Mechanical Engineers, Sir Christopher Hinton, Deputy Controller of Atomic Energy (Production), Risley, Lancs, took "Nuclear Reactors and Power Production." After describing the British experimental pile (B.E.P.O.) at Harwell, he gave an account of the engineering and construction problems solved in the erection of the two much larger Windscale piles (*Electrical Review*, 22nd January) for the production of plutonium on an industrial scale. These, like the B.E.P.O. prototype, were air-cooled thermal reactors using natural uranium as fuel and graphite as a moderator.

Water cooling was first considered, he said, because of the higher specific thermal rating thus obtainable, but water absorbed neutrons more readily than graphite and loss of coolant from the reactor core might lead to a dangerous release of fission products, necessitating the use of an inconveniently remote site. Since the main shielding was required only to reduce neutron escape and to secure biological safety from gamma rays and not for making the accurate measurements required for B.E.P.O. research, it was pierced with fewer holes. This permitted the use of forced draught, instead of induced draught, for the cooling air, so preventing contamination of the centrifugal blowers (driven by 2,400–3,000 h.p. 11 kV wound-rotor induction motors), which might have been caused by active material carried over from the pile.

The Windscale piles were monolithic structures on rafts each 21,000 sq ft supporting 58,000 tons. The chimneys were 404ft high and 44ft in diameter. The fission process itself could be operated at a very high temperature, but whereas the dimensions of the core of a reactor were determined primarily by nuclear physics, the permissible rate of heat release depended entirely on metallurgical considerations and on the engineering design of the cooling system and the choice of materials, which at present limited temperatures.

Natural uranium contained only a small proportion of the fissile element U235 and neutrons from a fission would be captured by U238 atoms, thus preventing a chain reaction. In a thermal reactor the uranium was therefore arranged as a lattice within a moderator, which slowed down the neutrons to "thermal velocities," at which they were less likely to be absorbed by U238 and more likely to produce fissions of U235 atoms. Uranium which had been enriched by a physical process to increase the percentage of U235 lessened the requisite dimensions of the reacting core. Further enrichment or else the blending of plutonium and U238 offered the prospect of constructing "fast" reactors without moderators in which fission was brought about by high-energy neutrons. Justification of the high cost of enrichment lay in the removal of the maximum quantity of heat from a given quantity of fuel, which would result from advances in engineering and metallurgical techniques.

For a graphite-moderated gas-cooled thermal reactor using natural uranium, the heat rating would be only about 1 MW/ton, which was determined by the heat transfer from the surface of the fuel elements to the gas stream. Heat transfer rates could not be improved beyond a certain point either by increasing gas velocity, since pumping power would become prohibitive, or by increasing the surface, since the canning material absorbed neutrons; this necessitated a greater charge of uranium to reach the critical size. Substantial gain in the power rating could be achieved only by increasing the surface temperature of the fuel elements, now restricted to about 750 deg F.

After irradiation, fuel elements were subjected to an expensive chemical process to remove fission products. This entailed increasing irradiation periods to achieve economy, during which time growth and distortion of the uranium occurred, tending to burst the container and allow leakage of active fission products into the coolant.

Reactors to give a higher heat output per ton of fuel (e.g. using natural uranium with a heavy-water moderator or using slightly enriched uranium with ordinary water as moderator and coolant) would require thinner fuel elements to keep down the temperature at the centre of the metal. Cooling by water under pressure gave the requisite heat transfer rates, but was liable to cause thermal stresses in the container material.

Power Station Reactors

With intermediate or fast reactors the uranium might be nearly molten in the centre of the core, and the gaseous fission products formed might produce high internal stresses. Reactors for power stations would have to be either inherently safe as regards fire and supercriticality or be so contained overall as to avoid danger from release of fission products. Piles moderated by graphite or heavy water with ordinary water cooling were inherently dangerous, but when cooled by air, carbon dioxide or helium they were inherently safe because loss of coolant would not increase the number of neutrons available to cause further fissions. Reactors using ordinary or heavy water both as moderator and coolant could also be designed to prevent a sudden increase of reactivity.

Accidents were possible with the more highly rated thermal reactors using enriched uranium because of the small thermal capacity of the core. Such plants would

probably have liquid metal as coolants and would have to be housed in vessels capable of withstanding the pressure that might arise if the coolant ceased to circulate and vaporized, causing dispersal of the fission products.

The lecturer then described four alternative types of nuclear reactor for power generation. The first, a graphite-moderated natural uranium reactor cooled by helium, carbon dioxide or nitrogen (in order of preference), was a development of the B.E.P.O. and Windscale piles. Outlet gas temperature would be about 660 deg F and heat ratings between 1 and 2 MW per ton of uranium. Cost per kWh for a prototype plant was estimated at 1d. This was the type now being built in Cumberland to deliver electricity to the grid. The second example was of the heavy-water moderated and cooled natural uranium variety, giving from 5 to 10 MW per ton. To prevent vaporization, the coolant would be at 500 lb/sq in, at which the boiling point of water was 467 deg F, but the high circulation rate would give much the same results as would gas cooling. Cost of electricity would probably be 0·75 to 1·0d/kWh.

In a third type ordinary water could be substituted for heavy water with uranium enriched to 20 per cent above normal concentration of U235. Coolant would be at 1,000 lb/sq in. It would be perhaps slightly inferior to the heavy water reactor in economics (owing to the cost of enrichment) but entailed much the lowest capital expenditure of any reactor envisaged.

The last type described, the intermediate or fast (as distinct from the thermal) reactor, had no moderator. Its small core would contain a fuel having a relatively high proportion of U233, U235 or Pu239 together with an element such as Th232 or U238 which could absorb neutrons to form a fissile material. Fissile material in the core represented the major item of capital cost. The heat rating would be perhaps 100 MW. Fast reactors, which could breed more fissile material than they consumed, could use plutonium produced as a by-product of thermal reactors. The predominant factor was the small size of the core and the large temperature gradients and thermal stresses in the fuel elements. Heat transfer to the coolant (desirably of liquid metal such as sodium or sodium-potassium alloy) involved difficulties of less importance.

An appendix to the lecture gave a simple explanation of the underlying theory of atomic energy.

Submerged Telephone Repeaters

THREE papers on the same general subject were presented on 4th March at the Institution of Electrical Engineers. The first, by Messrs. R. J. Halsey (Post Office) and F. C. Wright (Standard Telephones), dealt with submerged telephone repeaters for shallow water. The cost per carrier circuit over submarine cables not incorporating repeaters between shore stations, it was stated, increased as the square of the distance and even at less than 100 nautical miles was much greater than for land circuits. In 1943 the British Post Office laid the first submerged repeater, the mechanical design of which had been followed with small modifications only in the eighteen subsequent systems (tabulated), embodying 47 repeaters with a maximum of seven in any one cable. The life of repeaters was determined by the electrical components rather than by the mechanical, including ingress of water, and valves had not proved the least reliable of these. It had been established that repeaters could be laid and recovered without difficulty.

The Post Office had standardized one system which provided 60 both-way transmission circuits over a single coaxial cable with up to 10 repeaters in tandem and a British contractor had designed one with 36 circuits. It is considered that depths up to 1,700 fathoms could be satisfactorily dealt with and that when deep water repeaters had been fully developed it might be feasible to adopt the same design with less expensive rigid housings than those now developed for 3,000 fathoms. The most suitable power supply was constant direct current at 3,000 V with all repeater power circuits in series.

A second paper, by Messrs. A. H. Roche and F. O. Roe (Standard Telephones), related to the equipment needed to provide 36 telephone channels on each of two coaxial submarine cables, each including two submerged repeaters and laid between Oostmahorn in the Netherlands and Romo Island on the west coast of Denmark—142 nautical miles; this scheme was officially opened in September, 1951. The depth was never more than 22 fathoms. The system was the first stage of a scheme to provide some 240 circuits. The frequency range of signals in the Netherlands-Denmark direction was 24-168 kc/s and in the other direction 208-352 kc/s. Provision was made for a wide-band two-way broadcast channel to replace three speech channels when required. Each repeater (the components of which were described in detail) consisted essentially of a single three-stage negative-feedback amplifier affecting the signal currents in both directions over the cable. Its overall gain compensated for the loss in 40 nautical miles of cable. Power was fed to the repeater over the cables, d.c. being applied to the central conductor and returned through the sea. All valve heaters were in series, and the l.t. voltage was the sum of the voltage drop across them and a series resistor, totalling 220 V. Attenuation measurements during 18 months showed a change of ± 1 db on the cable alone, which was almost entirely accounted for by cable temperature variations.

The third paper, by Messrs. D. C. Walker and J. F. P. Thomas (Post Office), was entitled " The British Post Office Standard Submerged Repeater System for Shallow-water Cables with Special Mention of the England-Netherlands System."

After giving details of the design of the repeaters and discussing fault finding methods, pulse-monitoring units, power supply and cable terminations, the authors gave the results of equipping with four repeaters each of two 0·62in diameter paragutta cables, which were laid in 1937 for 80 nautical miles between Aldeburgh in England and Domburg in the Netherlands. The repeaters were so located that their gain matched the cable attenuation at maximum working frequency (552 kc/s). In favourable weather a repeater could be inserted in one day, about four hours being required to make a cable joint. Very little trouble was experienced in locating the cable, but hauling the cable on board to adjust the position for the final cut presented difficulties owing to its being deeply embedded. The recovery of the repeaters was relatively simple. The total cable attenuation at 554 kc/s and 17 deg C was 312·5 db for one and 314·5 db for the other.

Scottish Water Power

Effects of Capital Expenditure Restrictions

In the past five years water power production in the Highlands has nearly trebled and the capacity of plant has been more than quadrupled. Last year's increase in output, however, was comparatively small. Referring to this in its annual report,* the North of Scotland Hydro-Electric Board says that the capital cuts of 1949 retarded the Board's constructional programme by nearly 200 MW, the results of which are only now becoming "distressingly apparent."

Because of the small growth in hydro-electric power production, the steam power stations at Dundee and Aberdeen had to be run at an even higher rate than previously, generating some 363 million kWh, an increase of 68 million over 1952. The Board therefore had to buy 243,000 tons of coal costing £881,000 compared with 204,000 tons costing £689,000 in 1952. Nevertheless, the production of hydro-electric power was equivalent to a saving of about 617,000 tons of coal in the year.

From all sources, water, steam and diesel oil, 1,333 million kWh was generated. About 77 per cent of the total was required for the Board's area. The production costs per kWh were: hydro-electric 0·52d, steam 0·79d and diesel 1·89d. The number of kWh sent out from the Board's power stations for consumers in the area was 971 million, an increase of 109 million (12·5 per cent). In spite of this large expansion the peak demand of consumers in the area (284 MW) was only 3 per cent more than for 1952, largely on account of the mild weather in December last.

Under its contract with the British Electricity Authority the Board supplied 304 million kWh to Central Scotland, the same as in 1952. The maximum peak load supplied was 193 MW, which exceeded by 8 MW the amount which the Board had contracted to deliver. The maximum peak supplied in 1952 was 212 MW.

Hydro-Electric Development

There were 7,500 workers employed on the Board's hydro-electric and other constructional works at the end of the year—an increase of about 1,300 compared with the labour force employed at the end of 1952. The present state of the programme of hydro-electric development is as follows:—Already in operation (including pre-war Grampian scheme), 399 MW (average annual output 950 million kWh); under construction, 421 MW (1,263 million kWh); in course of promotion and survey, 307 MW (1,094 million kWh); total 1,127 MW (3,307 million kWh). Potential water power resources of the Highlands (not all of them economic) are estimated at nearly 10,000 million kWh per annum.

Contracts were placed and work began or is about to begin on the following schemes, with capacity (MW) in parentheses:—Breadalbane: Killin section (59) and St. Fillans section (26·5); Shin (40); Lower Moriston, Glenmoriston station (32); Allt-na-Lairige (6) and Kilmelfort (2).

A record total of 95,000ft of rock tunnelling was completed in 1953. The culmination of the high rate of driving was the final holing through of four large tunnels at Lawers in September and at Invergarry, Quoich (Glen Garry), and Ceannacroc (Glen Moriston) in November. The total length of tunnel driven in the eight years since the Board began tunnelling operations is now 72 miles while contracts have been placed for a further 25 miles.

In addition to the twelve dams on which construction was proceeding at the beginning of the year, work began on five more and contracts were let for a further five; the Gaur dam was completed during the year. The decision to use concrete made from blast-furnace slag by the Trief process in the Cluanie and Loyne dams in Upper Glen Moriston was carried a stage further by the completion and formal start-up of the plant in October. Fly-ash from power stations which burn powdered coal is being considered as a partial replacement of cement in the concrete of dams and a trial of this means of economizing in cement is shortly to be made at the Lawers dam. As another means of saving cement and therefore of costs, it was decided to build the Allt-na-Lairige dam of pre-stressed concrete. It is the first time that the principle has been applied to a dam in Great Britain.

Fourteen power stations are at present under construction, ten on the surface and four either wholly or partly underground. In the case of the surface stations the walls are to be either of solid masonry or to have masonry cladding using local stone. In all but one of the power stations so far brought into service by the Board there have been two or more generating sets as a safeguard against breakdown, but the increase in the number of stations and greater interconnection have now made it possible to design stations with only one set, with all the advantages of simplicity and economy. The Gaur station is of this type and six others under construction are Shira, Lawers, Invergarry, Quoich, St. Fillans and Comrie.

Transmission and Distribution

One of the highest transmission lines in Britain, that from Boat of Garten to Aberdeen by the Lecht Road (2,048ft above sea level), was put into service in 1953. The line from Fort Augustus to Newtonmore over the Corrieyairack Pass is being built and a line from the Shin scheme to Caithness is being promoted.

The Board is expanding its policy of undertaking comprehensive distribution schemes in country districts. The largest of these—the Strichen Scheme to supply a large part of north-east Aberdeenshire—was inaugurated at a ceremony near Turriff at which the first pole was erected in April, 1953. As a result of these schemes there will be a further steady increase in future in the number of farms and crofts connected to the mains. Six years ago one farm in 14 and one croft in 100 were linked up. Now, at the end of 1953, one farm in three and one croft in three were connected. Considerable time and money will be required to connect the remaining two-thirds of these potential consumers, since many are far away from the electric mains and, indeed, owing to the distance and expense, there are a few whom it may not be possible to reach for many years.

Capital expenditure on distribution was approximately £3,142,000 in 1953 and with the programme in hand and in contemplation it is anticipated that it will continue at least at that annual rate for about the next ten years. The Board is pursuing a policy of undertaking comprehensive distribution schemes in country districts. Examples of this are the Moray scheme, which will serve about 2,000 premises, including 750 farms, and the Strichen scheme, which will serve about 4,000 premises including 2,000 farms.

The charges for electricity to consumers in the Board's area were unchanged during 1953 although coal increased by 5s per ton and generation from coal-fired stations was higher than in previous years. The payment in lieu of rates increased by £45,000 and increases in salary and wage rates fixed under national agreements cost £48,000.

Sales of electricity in the Board's area during 1953 were 12 per cent higher than in 1952 and 59 per cent higher than

* H.M. Stationery Office, price 2s 6d.

in 1949. Greater use of electricity has helped to avoid increases in charges, so that since 1949 the average price per kWh paid by consumers, despite increasing costs, has risen by only 0·167d (see table).

During 1953, 7,848 electric cookers were installed. A striking example of development in this respect is afforded by the Aberdeen area where until three years ago the local authority had not installed any electric cookers in its houses.

	1949	1950	1951	1952	1953
New consumers	18,797	22,140	18,861	19,897	20,162
Cap. exp. on distribution, per annum £(million)	1·9	2·7	2·9	3·3	3·1
Average cost per consumer ...	£102	£122	£152	£165	£156
Plant installed, MW:					
Water power	87	285	368	391	399
Steam	131	131	132	131	127
Diesel	33	37	39	38	41
	251	453	539	560	567
Million kWh generated:					
Water power	322	522	702	889	914
Steam	320	284	318	296	364
Diesel	68	72	61	52	55
	710	878	1,081	1,237	1,333
Average price, d/kWh	1·416	1·402	1·411	1·498	1·583

At the beginning of 1951 the Council decided that tenants of new houses should have the type of cooker they preferred, and in the first year of the new scheme 13·8 per cent of the tenants elected to have electric cookers, while in the last few months of 1953 the proportion had risen to 44·4 per cent.

The Board continued to develop and encourage the use of electricity as a means of securing a better grass and hay crop in the comparatively wet conditions which prevail in the north and north-west of Scotland. The type of dryer with fans and heaters which the Board finally decided to develop operated successfully at seven farms. One at Plockton was run on a community principle for six crofters. The hay season was exceptionally wet there and had it not been for the electric dryer some of the crofters would not have been able to secure their crop. The cost of electricity used in drying the hay at Plockton was approximately £6 13s a ton load. Including the annual charges on the dryer, the total cost per ton was between £10 and £12.

Reading of consumers' meters in the Board's widespread rural areas is expensive and efforts have been made for some time to interest consumers in reading their own meters. As consumers find it easier to read cyclometer dial meters the Board is adopting this type.

Capital expenditure by the Board last year amounted to £15,878,000 and the total capital expenditure to the end of 1953 was £98,622,000, including about £12,500,000 incurred by local authority and company undertakings before they were transferred to the Board.

The Board had a total revenue of £7,581,459 (against £6,580,581) and after meeting all operating costs, and interest and sinking fund chargeable against revenue, it finished the year with a net surplus of £14,532.

FAIR TRADING

Activities of Irish Commission

UNDER the Restrictive Trade Practices Act, 1953, the Irish Fair Trade Commission was established on 12th June last to function as an investigating body in matters of trade. It has since given statutory notice of its intention to make fair trading rules concerning tyres, ropes (including cordage and twine), nails and screws, cutlery (spoons and forks), tableware (earthenware and china), electric light bulbs and petrol. It is at present holding inquiries into conditions of supply and distribution of radio sets and accessories.

Fair trading rules made by the Commission provide for freedom of entry to trade, freedom to compete fairly, assurance of supplies on equal terms and conditions, and liberty to traders to determine their own resale prices. The rules specifically prohibit price maintenance arrangements by manufacturers, price fixing, regulation of margins, conditional or exclusive dealing, territorial division of markets, the maintenance or publication of "black" or "white" lists and agreements between or by manufacturers, importers or traders for the limitation of competition by various devices. The chairman of the Commission is Mr. J. C. B. MacCarthy and members are Mr. F. Vaughan Buckley and Mr. J. J. Walsh.

An Irish correspondent says that a disturbing feature of the discussions which the Commission has had with some trade associations, and, indeed, with certain manufacturers, has been that they appear to look upon any kind of price competition as a form of unfair trading which is to be stigmatized as such and stamped out by all practicable means. This outlook has manifested itself in a creeping paralysis of price competition in large areas of distributive trading. It is clear that a situation exists which could be gravely prejudicial to the public interest.

The experience of the Commission in its investigations has shown the need to examine the effects of restrictive practices, and the justifications advanced for them, in relation to the particular circumstances of each trade. The functions performed by the distributor, and consequently the problems of distribution, vary in relation to different commodities or groups of commodities, and the number and variety of sources of supply have an obvious bearing on the degree to which competition may be restricted or suppressed at various stages of distribution.

The Commission has regard in all cases to the primary consideration of the interest of the consumer. The task is to strike a balance between the reasonable interests of the trade and the other important interests involved so that the public interest in the full sense may be safeguarded.

Heat Transfer by Radiation

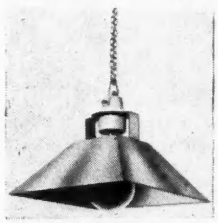
THE fundamental laws of thermal radiation are to be found in most text-books on heat but the engineer concerned with practical problems in the heating of buildings, furnace design, illumination engineering and similar fields needs a knowledge of the actual methods by which radiative transfer may be calculated. Fire Research Special Report No. 2, "Heat Transfer by Radiation," which has just been published by H.M. Stationery Office for the Department of Scientific and Industrial Research, price 1s 6d (40 cents U.S.A.), by post 1s 7½d, presents the information which is available together with tables of functions for use in making the calculations required in solving radiation problems.

The report describes the use of the configuration factor, the ratio of the radiation intensity at the receiving element to that near to the radiator, and the considerations which must be taken into account in determining the factor in particular circumstances. A section covers heat transfer between extended surfaces and between deflecting surfaces of various configurations.

NEW ELECTRICAL EQUIPMENT

Infra-Red Heaters

THE new infra-red heaters announced by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38–39, Upper Thames Street, London, E.C.4, have been specially designed for piglet rearing



Siemens infra-red heater for piglets and chicks

and in addition are ideal for poultry breeders. Installation is simple as the lamps are designed to operate two in series on a 200/250 V supply. The complete unit consists of a 100/130 V a.c. 250 W infra-red lamp, porcelain lampholder and a 10in square steel reflector. Each lamp has a guaranteed life of over six months' continuous heating, and under normal conditions one lamp in each coop should be sufficient.

The complete fitting is priced at 20s 3d including lamp, but replacement lamps (7s 9d clear; 8s 3d pearl) are subject to 18¼ per cent purchase tax in the United Kingdom.

Industrial Fryer

The latest addition to the range of industrial cooking equipment manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is a compact single-pan unit designed for quick frying. The body of the unit is made of heavy gauge mild steel formed to carry a welded heavy gauge steel pan. The switch panel is housed in a cupboard space below the pan, which also provides access to a draw-off tap. Cartridge type elements, which can be readily withdrawn without the pan having to be emptied, provide direct heating of the fat or oil. Heat control is by means of a thermostat operating through a relay contactor controlled by a rotary switch.

The overall dimensions are 2ft 3in wide by 2ft 3½in deep by 2ft 10in high, and the internal size of the pan is 20in in length by 16in wide by 8in deep. The fryer is finished in mottled grey vitreous enamel with polished chromium angle supports and the pan and top surround are polished mild steel. Maximum loading is 9 kW.

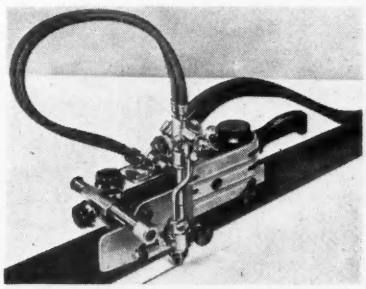
Quick Response Recorder

The latest continuous roll chart recorder to be introduced by EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4, contains two movements which are essentially d.c. recording voltmeters having a rapid response and negligible pen to paper friction. The maximum torque produced by the pen movement is about 7 oz-in. The recorder is servo operated and works in conjunction with an amplifier unit, to which it is connected by 5ft of 18-core flexible cable with plug and socket ends. The two channels on the chart are each 2⅞in wide with a $\frac{7}{16}$in margin between them. The maximum sensitivity may be set to suit customers' requirements between the limits ±10 V to ±4 V for a deflection of ±1$\frac{7}{16}$in and the instrument will record sinusoidal voltages up to 15 c/s with an amplitude error not exceeding 15 per cent for a peak to peak amplitude of 1½in. The linearity is within ±3 per cent. The power requirements are 140 W at 200/245 V 50 c/s, but for the marker pen a d.c. supply of 3 W at 15/20 V is required.

Portable Flame Cutter

The "Quicky B" straight line and circle flame cutting machine of the OXHYCARBON CO., LTD., 6, Hainthorpe Road, London, S.E.27, weighs only 13 lb. It is designed to cut steel from $\frac{3}{16}$in to 2½in thick and is operated by a universal 220/240 or 100/120 V motor. A simple rheostat comprises the speed control which is graduated directly in plate thickness to be cut, thus rendering a tachometer superfluous. The machine will cut bevels and, guided by hand, can be used for very simple profile work.

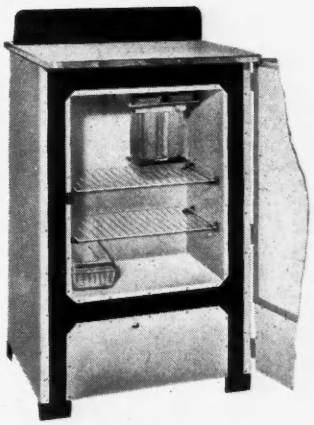
The machine is normally supplied complete with a trammel for cutting circles from 2½in to 40in diameter, a 3ft guide rail for straight line cutting, and a cutter with a box of nozzles for adapting the cutter to operate on acetylene, propane, coal gas or hydrogen.



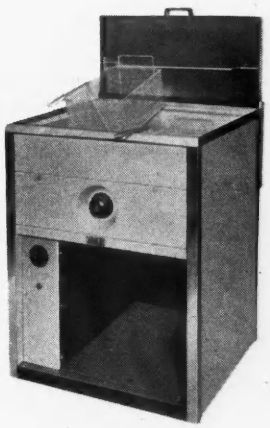
The "Quicky B" portable flame cutter

Absorption Refrigerators

Two new "Cresta" refrigerators are announced by INSULATIONS & CONSTRUCTIONS, LTD., St. John's Works, Tyler's Green, Penn, Bucks. One, a table-top model, has a capacity of 2 cu ft and is fitted with a "Cresta" absorption unit. It is thermostatically controlled and is available in a white enamel finish. The second is a 4 cu ft de luxe model and this also operates on the absorption principle. It incorporates a new type spiral shelf evaporator which supersedes the old box type and the makers claim that it gives a greater ice-making capacity with added cooling efficiency. Prices are £35 10s plus £14 4s purchase tax in the United Kingdom (2 cu ft) and £60 plus £24 purchase tax (4 cu ft).

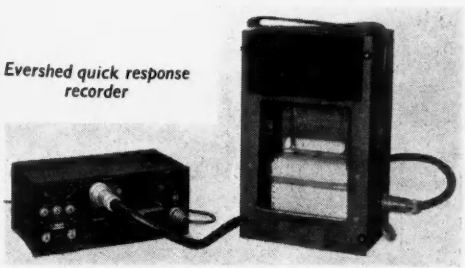


"Cresta" 2 cu ft table-top refrigerator



G.E.C. single-pan fryer

Evershed quick response recorder



Coal Mining Developments

Address by Director-General of Production

SPEAKING last week at a meeting of the Midland Branch of the National Association of Colliery Managers, Mr. E. H. Browne, C.B.E., director-general of production to the National Coal Board, referred to the carrying out by the Board of trial sea borings to prove underseas reserves of coal. Dealing with coal transport underground he said that he felt that although diesel locomotives were at present predominant they were not necessarily the only method. Now 90 h.p. electric battery locomotives were available and results so far had been very satisfactory: it might well be that the low maintenance cost of battery locomotives would prove a decisive factor.

An experimental electric trolley wire installation at Sandhole Colliery was put to work last July since when the four locomotives used had carried the normal haulage load smoothly and satisfactorily.

So far as novel developments were concerned the electrogyro locomotive was the most interesting possibility in this field. The equipment comprised a large storage fly-wheel which incorporated a change-pole squirrel cage motor, and was brought up to speed by coupling to an electricity supply at conveniently situated points. The gyro motor then acted as a generator and supplied power to the traction motors until the lowering of the fly-wheel revolutions necessitated re-speeding. The Board had decided to try out a locomotive of this kind on the surface for shunting work, and this might pave the way for underground use.

Underground communications had not kept pace with modern mining and present developments aimed at remedying this. V.h.f. radio-telephones had been installed in some coalfields for communication between rescue stations and their vans and other installations were being made. Normal radio communications appeared to be impracticable below ground, but wired radio communication was promising; experiments made below ground and in shafts, in conjunction with two manufacturers, had reached the stage where large-scale trials were called for. Underground telephone equipment and installations were often unsatisfactory for present-day needs and a fully automatic system sufficient in capacity for a large mine would be a real boon. New electronic devices such as germanium valves might assist in this development.

The N.C.B. was following three lines of development in the use of gas turbines. It was collaborating with the Ministry of Fuel and Power on an experimental 2,000 kW methane-fired open-cycle gas turbine installation at Stafford Colliery. Alternatively, it would try operating this, or another similar machine, on solid fuel plus methane. Thirdly, there was a project for an indirectly heated open cycle set, the aim being to consume inferior fuel, including slurry. If this type of generating equipment could be installed at reasonably economic cost, there might well be a useful application for the production of cheap electric power and heat where inferior fuel had to be produced in substantial quantities.

Engineering Wages

Reports of Court of Inquiry

LAST Friday the reports were issued of the dual Court of Inquiry set up by the Minister of Labour and National Service to inquire into the wages dispute in the engineering and shipbuilding industries. The report dealing with the engineering industry (Cmd. 9084, H.M. Stationery Office, 1s 6d) recommends the granting of a 5 per cent increase in wages (15 per cent was demanded by the trade unions). This would raise the minimum time rate for skilled workers from £6 16s 4d a week to £7 3s 2d and the rate for unskilled workers from £5 18s 4d to £6 4s 3d, with corresponding rises in piecework rates.

A broad survey of national and industrial conditions is made in the report. On the subject of profits in the engineering industry, which the unions claimed were sufficient to meet the increase without raising the prices, the Court says that there was no evidence that this was true of the whole industry although some concerns might have been able to do it. As to the possible inflationary effect, the Court thinks that this should not rule out consideration of any claim which is shown to be just. Having regard to the irregularity of overtime the Court is of the opinion that wage rates rather than total earnings should be taken into account when considering the rise in the cost of living. It says that the minimum time rate in the engineering industry is lower than in other industries; although average earnings compare favourably an appreciable number of workers receive only the minimum rate.

The present method of negotiating wages by meetings between representatives of the unions and of the employers' federation should, the Court thinks, be superseded by permanent negotiating machinery. One matter for early consideration would be the wage structure of the industry regarding which little has been done since simplification was recommended by a court of inquiry in 1948.

Assessing the possible influence of a wage increase on exports the Court says that unless it could be met out of profits it would have a material affect upon overseas trade. While it does not think that the increase which it recommends would by itself have disastrous results it recognizes that it is part of a general movement of wages, costs and prices.

Arising out of this the Court proposes that an impartial and authoritative body might be set up to make a comprehensive survey of the complex factors entering into the repeated claims for higher wages and with the national economy in view give advice and guidance on broad policy and possible action.

At a meeting on Monday last the Executive Council of the Confederation of Shipbuilding and Engineering Unions decided to adopt the Court's recommendation and asked the employers for a resumption of negotiations for an increase.

I.E.E. Centre Dinners

The annual dinner and dance of the Western Centre of the Institution of Electrical Engineers will be held on 12th March at the Seabank Hotel, Porthcawl. A reception will be held by Mr. J. Vaughan Harries, chairman of the Centre, and Mr. H. Bishop, President of the Institution.

The annual dinner and dance of the North Midland Centre of the Institution of Electrical Engineers will be held on 26th March at the Grand Hotel, Harrogate.

P.E.A. Contracts

CONTRACTS have been placed by the British Electricity Authority during the past month for power stations, transforming stations, and transmission lines, amounting in the aggregate to £8,342,748. The principal contracts include the following:—

Brighton "B" power station: Foundations for two turbo-generator sets.—John Morgan (London).

Portishead "B" power station: Superstructure.—John Laing & Son.

South Denes power station: Structural steelwork.—Dawnays, Ltd. Two 72 MVA generator transformers.—British Thomson-Houston Co.

Willington "A" power station: Main civil engineering works.—Marples Ridgway & Partners. Structural steelwork.—Edward Wood & Co.

Hams Hall "C" power station: Three 72 MVA 141, 6/11, 8 kV generator transformers.—General Electric Co.

Ocker Hill power station: Structural steelwork.—Horseley Bridge & Thomas Piggott.

Connah's Quay power station: Structural steelwork.—Francis Morton & Co.

Huddersfield power station: Reinforced concrete cooling tower.—Davenport Engineering Co.

Stella South power station: Auxiliary cables and accessories.—Pirelli-General Cable Works.

Chadderton power station: Roads and drains.—Fred Mitchell & Son.

Fleetwood power station: One 300,000 lb/hr boiler.—Richardsons Westgarth (Hartlepool).

Portobello power station: Boiler feed pumps.—G. & J. Weir.

Melksham substation: 275 kV, 7,500 MVA and 132 kV 3,500 MVA switchgear.—Metropolitan-Vickers Electrical Co.

Connah's Quay substation: 132 kV overhead line.—British Insulated Callender's Construction Co.

Carrington substation: 275 kV, 7,500 MVA switchgear.—Metropolitan-Vickers Electrical Co.

Three Bridges–Leigh: 132 kV overhead line.—British Insulated Callender's Construction Co.

Bedford–Goldington–Little Barford: 132 kV overhead line work.—Watsham's.

Monk Fryston–Rochdale: 275 kV overhead line.—Balfour Beatty & Co.

Rural Development in West Wales

At a meeting held in Carmarthen on 19th February under the chairmanship of Councillor I. W. J. Phillips (Milford Haven), the Western Committee of the South Wales Electricity Consultative Council considered the Board's proposals for Stages 6–15 of the rural development programme as far as they related to South Cardiganshire, Pembrokeshire and Carmarthenshire. The Board's proposals were explained by the manager of the Western Sub-Area, Mr. D. G. Gwyn, who said that the aggregate expenditure on the provision of mains, major development work and connection of "proximity premises" in the rural parts of West Wales during the next five years would be in the region of £2,500,000. Dealing with premises within half a mile of existing mains, Mr. Gwyn pointed out that (excluding premises in the major schemes) there were in the Western Sub-Area over 2,000 premises in the proximity category and he therefore stressed that the work of supplying these premises would take a considerable time.

Tariff Changes

The National Retail Tariffs Committee having recommended that Electricity Boards should adjust their standard industrial tariffs to reflect the altered form of the Central Authority's bulk supply tariff, the North Western Electricity Board has decided to make the following changes:—

"Unit" charges of 0·46d, 0·42d and 0·38d based on fuel at 38s per ton to be changed to 0·67d, 0·63d and 0·59d with a basic fuel cost of 60s per ton; this represents a reduction of 0·0012d/kWh. The fuel variation factor for supplies metered at medium voltage is to be altered from 0·0008d to 0·00075d and that for high-voltage supplies from 0·0008d to 0·0007d.

It is estimated that these adjustments will cost the Board some £63,000 in 1954–55. The Board has also decided to continue the "ceiling price" concessions after 1st April. This will cost £70,000 per annum.

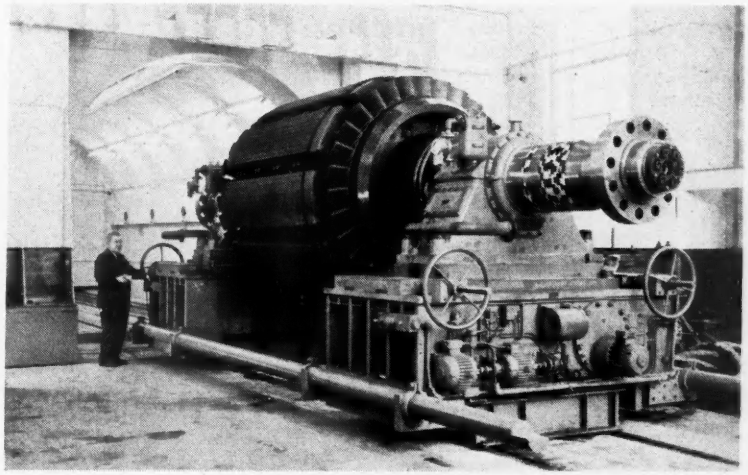
The Yorkshire Electricity Consultative Council has approved variations in the Board's commercial and miscellaneous premises tariffs and restricted hours tariffs. The basic fuel price of the commercial and miscellaneous tariff is to be raised from 38s to 60s per ton and the fuel price adjustments per 1d/ton variation in the coal cost are to be 0·0007d and 0·00075d instead of 0·00075d and 0·0008d for high and low voltage supplies respectively. The minimum demand under the two-part tariff is to be reduced from 20 kVA to 5 kVA. With regard to the restricted hour tariffs, the variations include a change in the period of restriction, which is to end at 6 p.m. instead of 7 p.m. on weekdays.

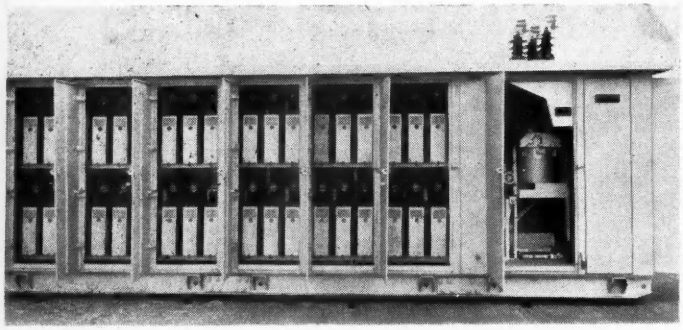
OVERSEAS

Hydro-Electric Plant for Spain

The first of two of the largest high-speed salient pole generators ever manufactured in Great Britain has recently been completed at the B.T.H. Rugby Works for the Artias hydro-electric power station in Spain. These 36,000 kVA machines, which are for horizontal operation, are each to be driven at 600 r.p.m. by an overhung Pelton wheel at each end, and are designed for a runaway speed of 1,100 r.p.m. An efficiency figure of over 98·2 per cent was obtained on tests, this representing a comfortable margin over the guarantee figure. The station is situated in the Pyrenees at a height of more than 3,700ft above sea level and consequently, due to transport difficulties, an interesting mechanical design of rotor was adopted. A stub shaft is bolted at each end of a pre-stressed hollow forging which forms the centre hub and to it each pole is secured by four dovetails. All poles and both stub shafts will be removed before the machines are shipped to site, and even so the centre hub will be only just within the maximum transport weight of 40 tons. The rotor of the first machine was tested at 1,100 r.p.m. in the new overspeed test house recently completed at the B.T.H. Rugby Works.

Rotor of 36,000 kVA generator in overspeed test house at B.T.H. Rugby Works





Power Factor Correction Equipment

Self-Contained Outdoor Banks with Unit-type Capacitors

WE recently had the opportunity to view on test-operation at the Ducon Works, London, of the Dubilier Condenser Co. (1925), Ltd., four capacitor banks, with a combined rated output of 4·5 MVAr at 6·9 kV, which have been built by the company for power factor correction service in Venezuela. The outstanding features of these banks are that they are self-contained in their steel housings complete with their switch and control gear and adequate instrumentation, and that the condensers proper are of unit construction, such construction being distinct from the tank type construction in which a plurality of small capacitor elements is enclosed in a single oil-filled tank which may cover sizes up to about 250 kVAr. In the unit type the capacitor elements are hermetically sealed in relatively small unit containers which may range from 1 or 2 kVAr up to about 20 or even 25 kVAr in output. Numbers of these separate units are banked together on racks or in cubicles to form capacitance banks. In many instances these racks of units are used indoors on factory loads or in power supply substations. The ability easily to change the number of units constitutes a great advantage of this form of construction.

The larger sizes of such capacitor units, i.e., units of 12, 20 or 25 kVAr output, are also employed on open racks mounted outdoors and protected only by an enclosing cage or fencing. In some of these installations, however, it is preferred to enclose the racks of capacitors in a building or housing, a procedure which is particularly desirable when switchgear or automatic control gear is located with the capacitors.

Naturally the housings are usually supplied and erected on site, but the four large h.v. banks in question have been specially designed to order. Complete with full automatic control gear and protective equipment, they are designed so that the loading can be increased to 12 MVAr without changing the switch and control gear.

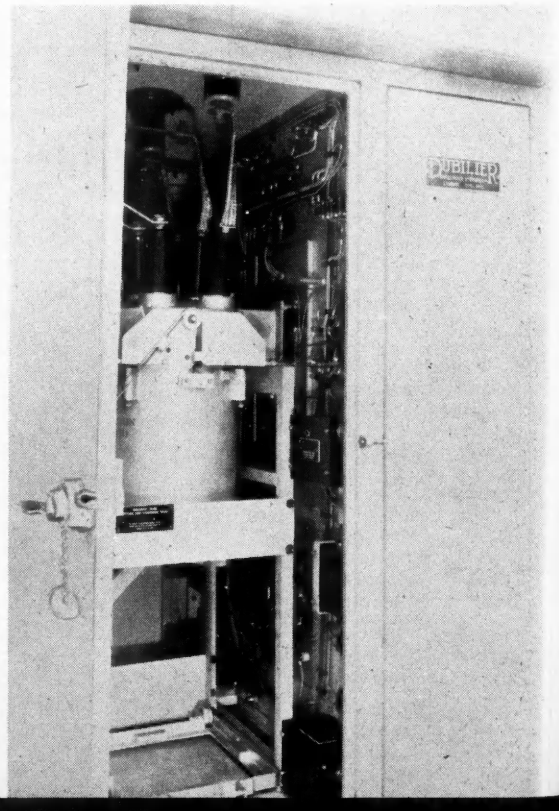
These capacitor equipments are intended for outdoor use on a 6·9 kV 60 c/s three-phase system, the four banks being rated initially for outputs of 1,380, 1,320, 600 and 600 kVAr respectively. These outputs can be increased to two banks of 1,440 kVAr and two of 720 kVAr, respectively, merely by adding further capacitor units (and h.r.c. fuses) into the existing frameworks and housings.

The housings are of zinc-sprayed sheet steel, aluminium painted, and are built in sections both to permit sub-division to facilitate transport and to permit adding further sections as desired.

The housings are mounted on skid bases with jacking plates and attachments for towing gear. Openings covered with expanded metal are arranged for air circulation inside the housings, and circulation may be assisted by fans when required, the fans exhausting at the rear end of the housings. The fans are controlled automatically so that they are in operation to draw air through the parts of the housings containing the capacitor units, whenever the capacitors are switched into circuit, since these banks are designed for use in a warm climate.

The switch and control gear is installed in a separate compartment in the front end of each of the housings. Connections are made to porcelain roof bushings for the incoming supply which is arranged direct to a B.T.H. triple-pole 400 A solenoid-operated oil circuit breaker having a rupturing capacity of 150 MVA.

Access to the control equipment is obtained through two hinged doors fitted at the front end of each housing. This compartment also contains the "Castell" interlocking keys which furnish the mechanical protection to prevent access to live parts in the interiors of the housings until the equipment has been switched off and earthed. Hinged doors also served by these interlocks are provided along both sides of the housings to give access to the



capacitor units and their fuses and to the current and voltage transformers and auxiliary wiring.

The capacitor units mounted in each housing are each rated at 20 kVAr at 4,000 V 60 c/s. They are all single-phase units and are arranged in three groups which are star connected to the 6·9 kV supply. The units themselves are standard Dubilier high-voltage type PFH capacitors which comprise a number of conservatively rated oil-impregnated paper dielectric capacitor sections arranged in series-parallel connections to suit the rated voltage of the capacitor unit. All these sections are constructed with extended foils which assist the cooling of the dielectric in the sections and ensure the maintenance of a reasonable working temperature in the capacitors. These sections are hermetically sealed in robust welded zinc sprayed steel containers each of which is fitted with a single porcelain terminal bushing. The second terminal of each unit is connected to the containing case. Permanently connected discharge resistors are fitted inside each unit. With this construction the units are arranged on metal frameworks inside the capacitor housing, these frameworks necessarily being mounted on porcelain stand-off insulators.

Busbar Arrangements

The connections to the units are made to the live busbars through h.r.c. fuses, the cases all being connected to a common neutral busbar which forms the star point of the group, the star point being insulated from earth. The main busbars and their connections are so disposed that any one unit can be withdrawn or inserted at will without disturbing the remainder, and to facilitate the removal or addition of units the fuses are arranged in spring clip connections in place of the more usual permanently bolted arrangement. Each capacitor bank is provided with automatic control gear designed on the lines of the Metrovick type NJ kVA relay, voltage and current controls being furnished by a 6,900/110 V potential transformer connected across two of the phases, and by a 500/5 A current transformer connected in the third phase of the load circuit to which the capacitor is to be connected. The potential transformer is included in the housing but the current transformer is external to it and joined up to the control relay by cables brought in through watertight glands fitted under the eaves of the housing.

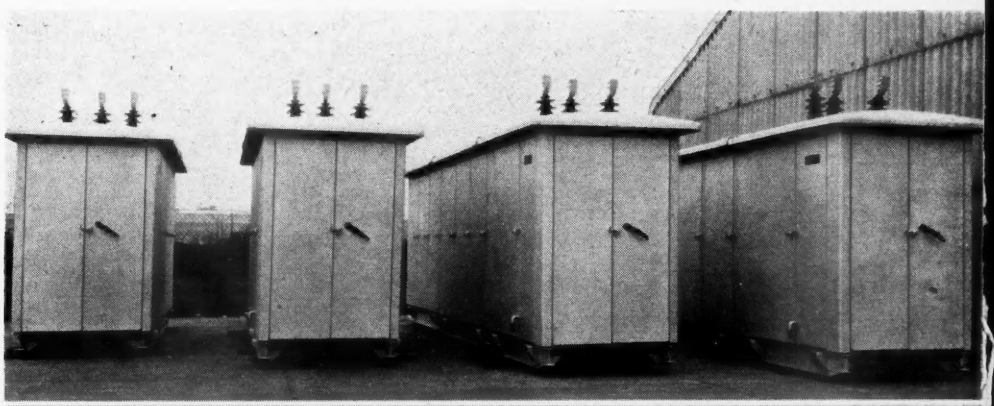
The "Castell" mechanical interlocks provide the following safety features: (*a*) The main oil circuit breaker and the isolating switches for the 110 V and 220 V auxiliary a.c. supplies must be opened and locked open and the earthing switch closed and locked closed before the doors along the sides of the housings can be opened; (*b*) the grounding switch cannot be moved to the open position, nor can the main oil circuit breaker or the isolating switches of the 110 V and 220 V auxiliary supplies be closed unless all the doors at the sides of the housings are closed and locked; (*c*) the earthing switch cannot be closed unless the main oil circuit breaker and the auxiliary circuit isolating switches are locked in the open position; (*d*) the main oil circuit breaker and auxiliary circuit isolating switches cannot be closed unless the earthing switch is locked open.

Electrical protection is furnished for excess currents by two overcurrent relays; for low supply circuit voltage by an undervoltage relay; and for failure of the 220 V auxiliary a.c. supply or of the fan motor circuit by an appropriate relay.

Any of these conditions serves to trip the main oil switch which is then electrically locked out in the open position by a further relay, so that it cannot reclose until the circuit has been reset manually.

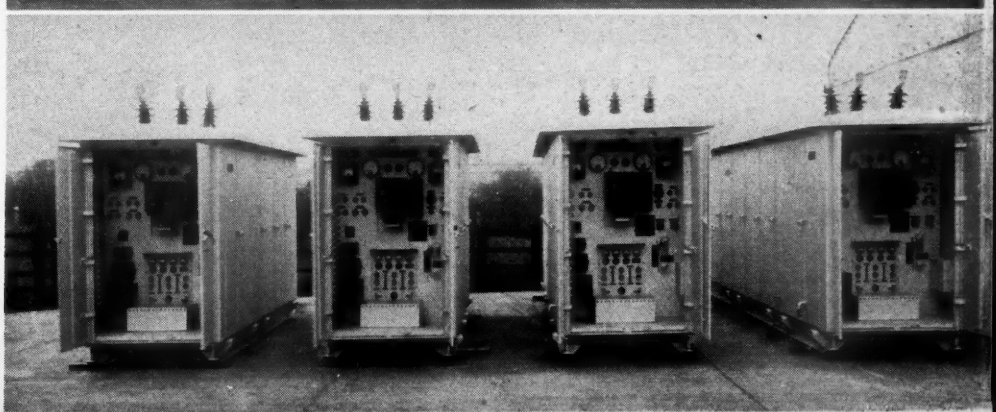
The control panel also includes a change-over switch to permit manual operation of the main oil circuit breaker in place of the automatic control. Ammeters showing the capacitor current, as well as the main load current flowing through the external current transformer, are fitted in the control compartment together with the usual range of supervisory meters relating to the "Nife" closing and tripping battery and its charging and trickle-charging circuits.

The main circuit breaker is fitted with auxiliary contacts which operate red and green indicating lamps showing outside the housing whether or not the capacitor bank is energized; also with a counter mechanism to show the number of times that the capacitor has been switched.



Top (page 434): Interior of 1,380 kVAr bank showing some of the capacitor units and the 6·9 kV oil circuit breaker

Left: 6·9 kV oil circuit breaker and auxiliary control housing



Right: General view of four capacitor banks with a combined rated output of 4·5 MVAr at 6·9 kV, and end view showing control gear

Financial Section

STOCKS and SHARES

FOR another week, the complexion of Stock Exchange markets has continued to look dull, particularly in comparison with the high activity which had been cheerfully pushing up industrial share prices until a month ago. In the absence of anything particularly stimulating in the way of dividend declarations and other company news, it still seems to be the disposition of investors to await further developments in both the political and the industrial fields before venturing much further. At the same time, signs of a revival in new issue activity promise to make claims on the amount of money available for new investment. This month's £30 million issue of I.C.I. loan stock is big enough to exercise a considerable influence from that point of view.

Irregular Price Changes

So far as electrical equipment shares are concerned, gains and losses have been roughly in balance over the past week. Activity in General Electrics at the time of the interim dividend declaration, which is to be at the same rate as before, left the official quotation 1s 3d to the good at 42s 6d, although recent dealings have taken place about 1s below that. Hoovers, with another rise of 1s 6d in advance of the final distribution, remained a conspicuously strong point. The same can be said of Lucas, which added 1s to previous advances. Chloride Electricals were in favour again, with a rise of half-a-crown, and others to show useful improvements included B.I.C.C., Henley's, Greenwood & Batley, Allen West, and Hackbridge & Hewittic. On the other hand, Parsons, Reyrolle and Automatic Telephone lost 1s 3d apiece for the second week in succession. Telegraph Constructions receded 1s 6d, and some ground was lost by Tube Investments, Plesseys and Deccas. English Electrics were dealt in around 41s 3d before being quoted ex the final dividend.

Morphy-Richards Bonus

Considerable activity developed in Morphy-Richards 4s ordinary in anticipation of the interim dividend declaration. Quoted at around 17s at the beginning of this year, the shares had been changing hands up to 22s 6d before coming back a little to 22s when the statement materialized. This leaves the rate of the interim unchanged at 15 per cent, but announces at the same time the proposal of a 50 per cent share bonus, and furthermore the board's expectation that it will be possible, in the ordinary course of events, to maintain the final payment at last year's rate of 25 per cent on the capital so increased. This estimate is made on the strength of a substantial increase in sales during the current year, and on the volume of orders on hand. In this event, shareholders will receive a total for the year equivalent to 35 per cent on the enlarged capital. Assuming an ex-bonus price of about 14s 9d for the

Week's Price Changes

Company or Board	Nom. Value	Middle price 1st Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1953 Highest	1953 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	89½		3	3	3 7 0	90	83 11/16
Brit. Elec. 1974/77	100	88½xd	+1	3	3	3 8 7	89	82
Brit. Elec. 1976/79	100	95		3½	3½	3 18 8	94⅞	88⅛
Brit. Elec. 1974/79	100	104	+½	4¼	4¼	4 1 9	104	99⅛
Overseas Electric Supply								
Calcutta Elec.	£1	20/-	+1/-	6†	6†	6 0 0†	21/-	18/-
East African Power	£1	21/6		7	7	6 10 3	25/-	20/9
Nigerian Elec.	£1	24/6		10	10	8 3 4	25/-	21/6
Palestine Elec. "A"	£1	19/3		Nil	Nil	Nil	19/3	7/7
Perak Hydro-Elec.	£1	14/9		Nil	6	8 2 9	17/10	13/6
Equipment and Manufacturing								
Aberdare Cables	5/-	8/6		20	20	7 7 0*	8/9	7/4
Aerialite	1/-	11/6		88½	88½	7 13 9	11/6	8/1
Allen, W. H.	£1	52/6	+1/3	15	15	5 14 3	51/-	42/10
Aron Elec. Ord.	£1	43/9		15	20	9 2 9	47/6	36/3
Assoc. Elec. Ord.	£1	46/-	+6d	20	20	4 7 0*	45/7	36/4
Automatic Tel. & El.	£1	63/9	−1/3	15	15	4 14 0	65/3	55/-
Babcock & Wilcox	£1	48/-	−1/-	18	18	—	50/-	40/4
Baldwin, H. J.	2/-	5/-		20	20	8 0 0	4/1	3/-
Bakelite	10/-	27/-	+3d	—	12½	4 12 7	24/9	16/-
British Aluminium	£1	39/-	+1/-	12	12	6 3 0	43/10	35/-
B.I. Callender's	£1	41/6	+6d	9	10	4 16 6	40/10	33/3
B.I. Callender's 6% Pref. ...	£1	25/6		6	6	4 14 10	26/3	23/-
British Thermostat	5/-	20/-		30	35	—	19/-	14/-
British Vac. Cleaner	5/-	14/6		25	25	8 12 6	16/6	11/-
Brook Motors	10/-	34/6	+3/-	20	20*	5 16 0	37/-	27/10
Brush Ord.	5/-	6/-		10	4	—	5/4	2/11
Bulgin, A. F.	1/-	3/6	+3d	30	30	8 11 6	3/5	2/6
Burco	5/-	13/-		35	35	6 14 8*	12/2	8/6
Chloride El. Storage	£1	52/-	+2/6	15	20	3 17 0*	44/10	32/3
Clarke Chapman	£1	76/-	+3/6	17½	20	5 5 3	70/6	57/6
Cole, E. K.	5/-	23/6		25	25*	5 6 5	23/9	14/2
Cossor, A. C.	5/-	8/3		10	10	6 1 3	11/4	6/4
Crabtree	10/-	26/3	−9d	17½	17½	6 13 4	32/6	23/9
Crompton Parkinson Ord. ...	5/-	15/9	+9d	11¼	20	6 7 0	16/-	8/7
De La Rue	5/-	12/9		35	Nil	Nil	14/6	6/3
Decca	5/-	36/-	−1/-	150	35*	4 17 3	37/9	17/6
Desoutter	5/-	18/9	+1/3	18	20	5 6 8	17/6	14/3
Dewhurst	2/-	5/9	−3d	19	19	6 12 3	6/9	5/-
Dictograph Tel.	2/-	5/7½	+3d	20	20*	7 2 4	5/10	3/10
Dubilier Condenser	1/-	4/9		28	25*	5 5 3	4/4	2/10
E.M.I.	10/-	13/-	−3d	12	8	6 3 0	15/3	11/6
Electrical Components	5/-	11/3		20	20	8 17 10	12/-	9/3
Elec. Construction	£1	55/-		15	15	5 9 0	56/-	50/6
Enfield Cable Ord.	£1	20/-		7½	5	5 0 0	24/10	17/-
English Electric	£1	41/3	−1/3	15	10*	4 14 3	40/8	34/-
English Electric 3¾% Pref. ...	£1	16/-		3¾	3¾	4 13 9	16/4	14/6
Ericsson Tel.	5/-	47/-		22†	22†*	2 6 9†*	48/9	36/-
Ever Ready	5/-	27/6	+1/-	35	35	6 7 3	29/-	25/-
Falk Stadelmann	£1	38/3		15	15	7 16 10	44/3	38/3
G.E.C. Ord.	£1	42/6	+1/3	22½	11¼*	5 6 0	46/-	36/3
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/7	24/9
General Cables	5/-	16/9		30	30	8 19 2	17/-	14/9
Greenwood & Batley	£1	43/9	+1/9	15	17½	8 0 0	41/6	38/-
Hackbridge Cable	5/-	12/9		20	20	7 16 9	13/-	10/4
Hackbridge & Hewittic	5/-	18/3	+6d	20	20	5 9 6	18/3	16/1
Hall Tel. Acc.	10/-	10/6	−6d	10	10	9 10 6	12/7	8/6
Heatrae	2/-	4/-		12½	12½	6 5 0	4/3	3/3
Henley's	10/-	16/6	+9d	20	10½*	6 7 3	19/4	16/-
Holophane	5/-	14/3		20	20	7 0 3	13/9	11/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

shares, the yield on that basis would be 9½ per cent.

N.S.W. Electricity Stock

Application lists opened on Monday of this week in connection with an issue of £2 million 4½ per cent stock, redeemable 1966/68, by the Electricity Commission of New South Wales. It is being made, in the first place, as a conversion offer to holders of one of the City of Sydney loans, but the public is invited to subscribe at a price of 99 for any stock not taken up in that way. The issue is not of trustee status, but the principal and interest are guaranteed by the Government of New South Wales, and the stock was expected to have a satisfactory reception in the gilt-edged market.

in Electrical Investments

Company or Board	Nom. Value	Middle price 1st Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1953 Highest	1953 Lowest
Equipment and Manufacturing—continued.								
Hoover	5/-	31/9	+1/6	35	25	3 18 9	26/10	20/3
I.C.I.	£1	56/9	−1/-	13	15	5 5 9	54/-	41/6
Intl. Combustion	5/-	17/6		15	20	5 14 3	15/6	12/1
Johnson & Phillips	£1	50/-		15	15	6 0 0	59/3	49/-
Lancashire Dynamo	£1	45/-		12½	12½	5 11 0	47/-	41/-
Laurence, Scott	5/-	15/9	+6d	15	15	4 15 3	14/6	11/9
Lister, R. A.	£1	35/6	−6d	9	12	6 15 0	34/3	27/9
London Elec. Wire	£1	40/-		12½	15	3 15 8*	38/3	26/-
Lucas, J.	£1	59/-	+1/-	9½	10½	3 13 6	51/3	35/6
Marryat & Scott	2/-	5/3		22½	22½	8 11 6	6/3	5/1
Mather & Platt	£1	56/6	+6d	12½	15	5 6 3	53/10	41/3
Metal Industries	£1	30/6	−1/6	15	12*	—	47/9	37/9
Midland Elec. Mfg.	£1	63/9	−1/3	15	15	4 14 3	63/9	56/3
Morphy Richards	4/-	22/-	+3/-	40	40	7 5 6	16/3	13/-
Murex	£1	51/-	−1/-	15	15	5 17 8	60/9	50/6
Newman Ind.	2/-	2/4½		10	10	8 8 6	2/10	2/-
Oldham & Son	1/-	2/9		35	17½*	6 7 3	2/10	2/2
Parnall (Yate)	5/-	5/-	−3d	6	6	6 0 0	4/9	2/6
Parsons, C. A.	£1	42/6	−1/3	10*	12½	—	48/-	27/9
Plessey	5/-	43/6	−9d	25	30	3 9 0	37/-	20/1
Pye Deferred	5/-	19/-		18	20	—	16/3	10/6
Revo	10/-	17/6		27½	27½	—	17/6	13/11
Reyrolle	£1	70/-	−1/3	10*	12½	—	79/-	51/-
Rheostatic	4/-	11/3		16½	19	6 15 0	12/-	8/-
Richardsons Westgarth	5/-	11/-	+1/-	12	15	6 16 3	11/1	8/6
Scottish Cable	4/-	13/9	+3d	32	20*	5 16 3	13/3	11/1
Siemens Ord.	£1	38/3		10	10	5 4 7	37/-	31/6
Smith (England), S.	4/-	13/9		12½	15	4 7 3	12/6	7/11
Southern Areas	£1	18/-		5	6	6 13 4	19/7	10/3
Strand Elec.	5/-	8/9		17½	17½	10 0 0	10/-	7/9
Sturtevant	5/-	34/-		17½†*	18·1†*	—	29/9	20/10
Sun Elec.	£1	25/-		15	15	12 0 0	27/-	24/6
Switchgear & Cowans	5/-	12/6		22½	22½	9 0 0	16/9	12/6
Taylor Tunnicliff	5/-	11/9		25	12½*	5 6 5	12/3	9/6
T.C.C.	10/-	43/9		20	20*	—	42/6	31/5
T.C. & M.	£1	31/-	−1/6	10	8½*	5 9 9	31/6	25/6
Telephone Mfg.	5/-	8/6		10	10	5 17 8	9/4	7/1
Thorn Elec.	5/-	16/3	+3d	12½	12½	3 17 0	14/-	7/10
Thornycroft	£1	36/3		15	15	8 5 6	54/-	29/9
Tube Investments	£1	65/-	−1/3	15*	15	4 12 4	71/9	54/-
Vactric	5/-	8/9	−1/3	Nil	Nil	Nil	10/3	3/6
Veritys	5/-	7/-		7½	10	7 2 9	5/4	4/1
Wallsall Conduits	4/-	46/3		70	70*	6 4 6	47/6	43/9
Ward & Goldstone	5/-	43/9		45	45*	5 2 9	46/-	29/9
Watford	2/-	5/3		25	25	—	5/6	4/10
Westinghouse Brake	£1	66/3		14	15	4 10 6	64/-	51/3
West, Allen	5/-	15/-	+1/-	15	15	5 0 0	14/4	10/3
Wolf Electric	5/-	13/6		—	15	5 11 0	12/8	9/6
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	84½		—	6	7 2 0	91	77
Ord.	100	52½		—	3¾	7 2 10	57½	53
Anglo-Portuguese	£1	22/-	−9d	8	8	7 5 6	23/9	20/1
Brit. Elec. Traction:								
Def. Ord.	5/-	42/6	+6d	25	35	4 2 6	39/6	21/3
Cable & Wireless:								
Ord.	100	166½	+1	8	9	5 8 0	148	124
4% Loan	100	97½		4	4	4 2 1	97½	93
Calcutta Trams	£1	19/-		6†	2½†	—	23/6	16/-
Cape Elec. Trams	£1	14/6	+6d	5½	5½	7 11 9	13/-	9/-
Marconi Marine	£1	28/9		10	10	6 19 2	31/6	26/9
Oriental Tel. Ord.	£1	80/-		16	16	—	75/-	59/-
Telephone Props.	£1	4¾		8	8	—	126/3	33/-
Telephone Rentals	5/-	9/6		10	10*	—	10/-	6/8

Clarke Chapman Results

The single dividend of 20 per cent for 1953 now declared by Clarke Chapman comes well up to market expectations, and the price of the £1 shares has been marked up accordingly by 3s 6d to 76s. It represents an increase of 1½ per cent on last year's payment, and involves the distribution of only about a fifth of the slightly increased net earnings of £276,000. There is consequently no deviation from the strictly conservative lines of the company's dividend policy. As an outcome of that policy, the reserves of the business have grown to be substantially larger than the nominal amount of capital. A proposal to capitalize part of them in the issue of a 50 per cent capital bonus will go some way towards removing the disparity. After deduction of the value of the dividend from the price of the shares, the latter will offer a yield of nearly 5½ per cent.

I.C.I. Proposals

After rising above 58s on the strength of the company's capital proposals, I.C.I. £1 shares eased to 56s 9d. At this level, the yield works out at 5¼ per cent on the basis of the total of 15 per cent which the company expects to distribute in respect of 1953. The coming operations remain a principal subject for discussion in the industrial market. So far as the intended 100 per cent share bonus is concerned, financial commentators are having their work cut out, as usual on these occasions, in trying to correct misrepresentations of the offer as a free and tangible gift to stockholders out of undistributed profits. It still seems insufficiently well appreciated that these bonus distributions add in themselves nothing to the stockholder's income, or to the value of his investment. Forms are due to go out on 10th March inviting applications for the £30 million 4½ per cent loan stock, the lists for which will close a fortnight later.

Company News

Midland Electric Manufacturing are paying a 15 per cent ordinary dividend for the fourth year in succession. It takes only £37,000 net from a profit, after tax, of £145,000, leaving the bulk of the surplus to fortify further an already strong balance-sheet position. The £1 shares are quoted in the market at 63s 9d. Bruce Peebles & Co. report a 60 per cent rise in the earnings for 1953 (despite a £100,000 increase in taxation) and are

adding a special 10 per cent bonus to the unchanged dividend rate of 15 per cent.

Overseas Companies

Palestine Electric shares have been a better market, at prices up to 20s, since reports began to come through concerning the Israel Government's offer to acquire them. The original proposal for the purchase of shares on the London register at 29s 6d, by instalments over a period, is stated to be accompanied now by various alternatives by which holders may defer or decline acceptance. Brazilian Traction shares have remained uncertain at around $14 since the Brazilian President's references to State electricity undertakings, and were not greatly affected last week by news of the $18 million loan granted to the company by the International Bank. As on the occasion of previous loans from the same source, the money is intended to pay for imported plant and equipment, while the company is expected to finance from its own resources the balance of funds required in connection with the latest development project, a thermal electric power plant near Sao Paulo.

REPORTS and DIVIDENDS

International Combustion Africa, Ltd., reports a trading profit for the year ended 30th September last of £173,943, as compared with £139,578 for 1951–52, and after providing £51,668 for taxation, there is a net balance of £122,275 (£98,278), plus tax surplus and sundry profits of £1,238. It is proposed to pay a final ordinary dividend of 20 per cent, again making 30 per cent for the year, and to place £50,000 to general reserve. The balance carried forward is £11,635 (against £6,372 brought in).

Sir George Usher (chairman) states that there has been a falling-off in inquiries for certain products consequent upon the change in the economic structure of the country during the year. Although the value of unexecuted orders has decreased, orders on hand are still over £5,000,000.

A. H. Hunt (Capacitors), Ltd., in a preliminary statement, reports group profits for 1953, after meeting all charges, including £69,316 for taxation, of £52,693, as compared with £40,834 for 1952. The subsidiary company was acquired during the year and the comparable figures for 1952 therefore relate to A. H. Hunt (Capacitors) only. From the profits £1,026 is written off share issue expenses, and £25,000 is placed to general reserve. It is proposed to pay a final dividend of 17½ per cent making 25 per cent for the year. This is at the same rate as last year, but is paid on increased capital. The balance carried forward in the accounts of A. H. Hunt (Capacitors) is £44,730 (£41,091), and in the accounts of the subsidiary company £1,166.

Morphy-Richards, Ltd., has declared an interim dividend of 15 per cent (unchanged).

The directors announce that the consent of the Treasury has been obtained to a proposed issue of 302,500 ordinary shares of 4s each, credited as fully paid by way of capitalization of reserves. Subject to the passing of the necessary resolution at an extraordinary general meeting to be convened for 18th March, it is proposed to issue the shares to ordinary stockholders in the proportion of one new share for every two 4s units of ordinary stock held. The new shares will rank for the full amount of any final dividend to be declared on the ordinary capital for the year ending 30th June next. Sales to date, both at home and overseas, show a substantial increase over the previous year. In view of the volume of orders in hand, and if nothing adverse develops, the directors expect to recommend on the increased capital the same final dividend as for the last five years, namely 1s per share (25 per cent actual), less tax.

R. A. Lister & Co., Ltd., reports that, subject to audit, the group net profit attributable to the parent company is £219,154 for the year ended 30th September last, as compared with £274,936 for the preceding year. Taxation absorbed £385,701. It is proposed to pay a final ordinary dividend of 9½ per cent making 12 per cent for the year (against 9 per cent).

Clarke, Chapman & Co., Ltd., report that after providing £163,308 for taxation, the net profit for the year ended 31st December last is £275,763, as compared with £266,791 for the preceding year. Reserves receive £170,000 and it is proposed to pay an ordinary dividend for the year of 20 per cent (against 17½ per cent).

Subject to Treasury consent, it is proposed to issue one new share for every two held.

The Midland Electric Manufacturing Co., Ltd.—The net profit for 1953, after deducting £198,000 for taxation, is £145,088, as compared with £155,811 for 1952. The dividend for the year is maintained at 15 per cent.

The New South Wales Electricity Commission is issuing at £99 per cent £2,000,000 of 4¼ per cent registered stock, 1966–1968. This is an offer of conversion to holders of a similar amount of Sydney 5¼ per cent debentures which mature on 1st May next. Holders who convert will receive a cash payment of £1 per cent representing the difference between the issue price of the new stock and the redemption price of the old loan. Debentures not converted will be paid off at par on 1st May, together with six months' interest then due.

Associated Electrical Industries, Ltd., reports a trading profit for 1953 of £13,456,000, as compared with £12,114,000 for 1952, and after meeting all charges, including £1,377,000 set aside for increased replacement cost of fixed assets, but before taxation, there is a balance of £10,527,000, to which is added investment income of £218,000. Taxation absorbs £7,812,000 and the net distributable profits are £2,933,000 (against £2,702,000). Of this £1,433,000 is retained in subsidiaries, leaving £1,786,000 attributable to the A.E.I. It is proposed to pay a final ordinary dividend of 6¼ per cent, together with a cash bonus of 1¼ per cent, on £17,741,192 making 11¼ per cent for the year, which is equivalent to 22½ per cent on the ordinary stock before the recent one-for-one share capitalization, and compares with 20 per cent for 1952. The interim dividend of 7½ per cent was paid on the £8,870,596 stock.

Bruce Peebles & Co., Ltd., in a preliminary statement, report a profit for the year to 31st December last of £434,307, an increase of £159,272 as compared with the preceding year. Taxation charged is £270,000, leaving a balance, subject to depreciation, of £164,307 (against £105,035). General reserve receives £110,000. It is proposed to pay a dividend for the year of 15 per cent (unchanged), and in addition to pay a special bonus of 10 per cent.

The General Electric Co., Ltd., is maintaining its interim dividend on the ordinary capital at 3½ per cent.

Increase of Capital

London Electric Wire Company & Smiths, Ltd.—Increased by £1,000,000, in £1 ordinary shares, beyond the registered capital of £2,000,000.

Liquidations

Electrical & Radio Installations Co. (Surrey), Ltd.—Meeting 26th March at 62, Lynwood Drive, Worcester Park, Surrey, to receive an account of the winding-up by the liquidator, Mr. G. A. Burton.

New Products (Nottingham), Ltd., electrical goods manufacturers.—Winding up voluntarily. Liquidator, Mr. H. B. Bradfield, Friary Chambers, Friar Lane, Nottingham, appointed 19th February. Particulars of claims to the liquidator by 20th March.

Premier Electric Services, Ltd.—Meetings of members and creditors on 11th March at the offices of A. C. Palmer & Co., Court Chambers, Friar Lane, Leicester, for the purposes provided for in section 299 of the Companies Act, 1948.

Bankruptcies

Bankruptcy

F. L. Napier, 5, School Road, Sale, Ches., electrical contractor.—Trustee, Mr. G. H. Eaves, 47, Mosley Street, Manchester, 2, released 11th February, 1954.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 8th March

BRADFORD.—Technical College, 7.15 p.m. Bradford Engineering Society. "Television," by G. N. Patchett.

BRISTOL.—S.W.E.B., Colston Avenue, 6 p.m. I.E.E. Western Centre. "Telemetering for System Operation," by R. H. Dunn and C. H. Chambers.

DUNDEE.—Mathers Hotel, 7.30 p.m. Incorporated Plant Engineers, Dundee Branch. Annual general meeting.

LEICESTER. — Electricity Offices, Charles Street, 7 p.m. Leicester Electrical Society. "Electrical Equipment in the Hosiery Industry," by E. W. Freeman.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "How can Electrical Methods Enhance Industrial Productivity?" opened by Sir Henry Clay, Bt.

St. Ermin's Hotel, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Electric Motor Application," by A. N. D. Kerr.

NEWCASTLE-UPON-TYNE.—Neville Hall, Westage Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Some Design Features of the Semi-Outdoor Power Station at Ince," by F. H. S. Brown.

SHEFFIELD.—The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "Fashion and Creative Photography in Advertising," by J. Short.

Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. "The Use of High Frequency Heating in the Metallurgical Industry," by J. B. Ingall.

STAFFORD.—Technical College, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "Arc-Quenching Circuits," by B. H. Stonehouse. "The Axial Gap Motor," by D. Beith. "Electric Shock," by R. Bruce. (Joint meeting with the North Staffordshire Students' Section.)

Tuesday, 9th March

BELFAST.—Presbyterian Hostel, Howard Street, 6.15 p.m. I.E.E. Northern Ireland Centre. "Modern Developments in Atomic Energy," by Dr. T. E. Allibone.

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "Computing Machines," by Dr. T. Kilburn.

GLASGOW.—425/427, Sauchiehall Street, 7 p.m. Incorporated Plant Engineers, Glasgow Branch. Annual general meeting.

KENTON.—Rest Hotel, Kenton Lane, 8.15 p.m. A.S.E.E. North West London Branch. Lecturettes.

LEEDS.—I.E.E. North Midland Centre, Students' Section. Visit to Tetley's Brewery at 7 p.m.

LONDON.—2, Savoy Hill, 6 p.m. Illuminating Engineering Society. "Flicker in Relation to Interior Lighting," by J. B. Collins and R. G. Hopkinson.

Savoy Place, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "The Theory and Application of Transistors," by F. F. Roberts and H. G. Bassett.

At the Royal Society of Arts, John Adam Street, 7 p.m. Incorporated Plant Engineers, London Branch. Annual general meeting.

Connaught Rooms, W.C.2, 12.30 for 1 p.m. Electrical Industries Club. Luncheon. "The Possibilities of East-West Trade," by J. B. Scott.

MANCHESTER.—Midland Hotel, 6.45 p.m. or 7.15 p.m. I.E.E. North-Western Centre. Annual dinner.

NEWPORT.—Tredegar Arms Hotel, 7 p.m. Newport and District Electric Club. "Aluminium Sheathed Cables," by P. M. Hollingsworth.

NOTTINGHAM.—Gas Board Demonstration Theatre, 7 p.m. I.E.E. East Midland Centre. "Planning Procedure for Rural Development," by A. J. Miller and R. Stephenson. "The Development of Precision Electric Clocks," by P. Harvey.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Students' Section. "The Making of a Professional Engineer," by Prof. E. B. Moullin.

STOKE-ON-TRENT.—31, Kingsway, 6 p.m. I.E.S. Stoke-on-Trent Group. "Lighting of Film Studios," by H. M. Ferguson.

Wednesday, 10th March

ABERDEEN.—Caledonian Hotel, 7.30 p.m. I.E.E. North Scotland Sub-Centre. "Economic Aspects of Overhead Equipment for d.c. Railway Electrification," by O. J. Crompton and G. A. Wallace.

BETCHWORTH.—Broome Park, 10.30 a.m. E.I.B.A. Surrey Branch. Annual meeting.

BIRMINGHAM.—James Watt Institute, 6.45 p.m. I.E.E. South Midland Centre, Students' Section. "Some Factors Determining the Performance of Insulation," by Miss M. K. Weston.

95, New Street, 7.15 p.m. A.S.E.E. Birmingham Branch. "Electroplating," by A. F. Brockington.

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "Further Applications of X-rays: Some Special Diagnostic Examinations," by E. Hudson.

EDINBURGH.—25 Charlotte Square, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. Annual general meeting.

EXETER.—Rougemont Hotel, 3 p.m. I.E.E. South-Western Sub-Centre. "Colour Television: Some Subjective and Objective Aspects of Colour Rendering," by G. T. Winch.

HUDDERSFIELD.—Y.E.B., Market Street, 7.30 p.m. I.E.S. Huddersfield Group. "New Lamps, New Uses and New Lighting Techniques," by R. V. Mills.

LANCASTER.—N.W.E.B., North Road, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "Some Aspects of the Design of v.h.f. Mobile Radio Systems," by E. P. Fairbairn.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. "Study of some of the Properties of Matter Affecting Valve Reliability," by Dr. E. A. O'Donnell Roberts.

MANCHESTER.—Engineers' Club, Albert Square, 2 p.m. Institute of Fuel, North-Western Section. "The Design and Operation of Small Water-Tube Boilers," by G. Steward. (Members' luncheon 1 p.m.)

NOTTINGHAM.—E.M. Gas Board Showrooms, Parliament Street, 7 p.m. Incorporated Plant Engineers, East Midlands Branch. Annual general meeting.

PORTSMOUTH.—Municipal College, 6.30 p.m. I.E.E. Southern Centre. "Metadynes and Amplidynes," by E. J. Davies.

WOLVERHAMPTON.—Compton Grange, Compton Road, 7.30 p.m. Institution of Engineering Inspection, Wolverhampton Branch. "Engineering Applications of Electro-deposited Metals," by J. W. Oswald.

YORK.—City Hotel, Lendal, 7.30 p.m. A.S.E.E. York Branch. "Machining Metals."

Thursday, 11th March

DUNDEE.—Royal Hotel, 7 p.m. I.E.E. North Scotland Sub-Centre. "Economic Aspects of Overhead Equipment for d.c. Railway Electrification," by O. J. Crompton and G. A. Wallace.

GLASGOW.—At the Institution of Engineers and Shipbuilders, 7 p.m. British Institution of Radio Engineers, Scottish Section. "The Acoustic Design and Measurement of Buildings," by H. C. Watson.

GREAT MALVERN. — Winter Gardens Restaurant, 7.15 p.m. I.E.E. South Midland Centre, Worcester and Malvern District meeting. "Colour Television," by G. G. Gouriet.

LIVERPOOL.—Electricity Showroom, Whitechapel, 7 p.m. E.P.E.A. Merseyside Technical Group. "Gas Turbines," by F. Hickson.

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. Extra meeting. "An 8 MeV Linear Accelerator for X-ray Therapy," by C. W. Miller.

MANCHESTER.—N.W.E.B. Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "Street Lighting Costs," by T. L. Robinson.

College of Technology, 7 p.m. British Institution of Radio Engineers, North-Western Section. "Colour Television," by G. B. Townsend.

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7 p.m. Incorporated Plant Engineers, North-East Branch. Annual general meeting.

SWANSEA.—Central Public Library, Alexandra Road, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "Design Features of Certain British Power Stations," by S. D. Whetman and A. E. Powell.

Friday, 12th March

EDINBURGH.—The University, 7 p.m. British Institution of Radio Engineers, Scottish Section. "The Acoustic Design and Measurement of Buildings," by H. C. Watson.

HANLEY.—Grand Hotel. E.I.B.A. North Staffordshire Branch. Buffet dance.

LONDON.—Grosvenor House, W.1. Institute of Marine Engineers. Annual dinner.

164, Shaftesbury Avenue, 7 p.m. Television Society. "Trick Effects in Television Production," by D. R. Campbell.

Townsend House, Greycoat Place, 7 p.m. Junior Institution of Engineers. "General Principles of Boiler Water Treatment," by W. F. Gerrard.

Feathers Hotel, Broadway, S.W.1, 6 p.m. Electrical Trades' Commercial Travellers' Association. General meeting.

MANCHESTER.—Grand Hotel. Manchester Association of Engineers. Dinner and dance.

NOTTINGHAM.—Victoria Station Hotel. I.E.S. Nottingham Centre. Ladies' evening.

NEWCASTLE - UPON - TYNE. — Incorporated Plant Engineers, North-East Branch. Annual dinner and dance.

PORTHCAWL.—Seabank Hotel, 7 for 7.30 p.m. I.E.E. Western Centre. Annual dinner and dance.

STOKE-ON-TRENT.—Copeland Arms Hotel, 7.30 p.m. A.S.E.E., Stoke and Crewe Branch. "Lighting in the Theatre," by P. Corry.

Saturday, 13th March

HARWELL.—I.E.E. Cambridge Radio Group. Visit to the Atomic Energy Research Establishment.

LONDON.—I.E.E. London Students' Section. Visit to Beckton Gas Works, E.6., at 10 a.m.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 14th April from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1947

4424. Akt.-Ges. Brown, Boveri & Cie.—Magnetic induction accelerators. 14th February, 1947. Cognate application 4425, 2nd February, 1947. (707211.)

1948

20853. Hemingway, A. V., and Atkinson, P. D.—Method of and apparatus for producing electric power outputs from weak magnetic fields. 5th August, 1949. Cognate application 113, 3rd January, 1949. (707213.)

1949

565. Elliot Bros. (London), Ltd.—Calcuating machines. 6th January, 1950. (707371.)

6163. Postmaster General. — Multiplex communication systems. 20th July, 1950. (707373.) 27999.—Electrical pulse modulators. 6th October, 1950. (707379.)

20497. Simplex Electric Co., Ltd.—Control of automatic toasters. 7th May, 1951. (707377.)

27704. Sargrove Electronics, Ltd., Sargrove, J. A., and Ball, D. A.—Electrical apparatus. 17th October, 1950. (707219.)

31068. Telegraph Construction & Maintenance Co., Ltd.—Electric cable insulation or sheathing. 4th December, 1950. (707133.)

1950

1095. Standard Telephones & Cables, Ltd. (Hertog, M. den).—Automatic telecommunication exchange systems. 12th January, 1951. (707221.)

2388. British Telecommunications Research, Ltd.—Electrical signalling systems. 25th January, 1951. (707382.)

5480. Postmaster General.—Electric pulse modulators. 28th February, 1951. (707384.) 4936.—Electrical pulse frequency dividers and the like. 28th February, 1951. (707401.)

7037. Du Mont Laboratories, Inc., A. B.—Cathode-ray tube electrode. 21st March, 1950. (707223.)

15478. Anderson, Boyes & Co., Ltd., and Anderson, A.—Electric switchgear boxes. 21st June, 1951. (707046.)

16411. General Electric Co., Ltd., Hayes, A. G., McKeag, A. H., and Welch, E. E.—Cathode-ray tubes having evacuated envelopes comprising metallic and vitreous parts. 26th June, 1951. (707135.)

20838. English Electric Co., Ltd.—Speed control systems for a sequence of electric motors. 17th August, 1951. (707138.)

21149. Automatic Telephone & Electric Co., Ltd.—Electrical signalling and control systems and apparatus. 14th August, 1951. (707231.)

28528. British Telecommunications Research, Ltd.—Arrangements for producing a step-by-step linear drive. 5th November, 1951. (707390.)

29225. British Insulated Callender's Cables, Ltd.—Length measuring device. 29th November, 1951. (707392.)

31522. Marconi's Wireless Telegraph Co., Ltd.—Extra-high-tension supply circuit arrangements for television receivers. 13th September, 1951. (707056.)

1951

759. Akt.-Ges. Brown, Boveri & Cie., and Williams, W. P. (Akt.-Ges. Brown, Boveri & Cie.).—Magnetic induction accelerators. 14th February, 1947. (Convention date not granted.) Divided out of 707211. (707236.)

1122. Marconi's Wireless Telegraph Co., Ltd.—Extra-high-tension supply circuit arrangements for television receivers. 13th September, 1951. (707058.)

1322. National Research Development Corporation.—Arc welding. 17th January, 1952. (707395.)

3791. Switchgear & Cowans, Ltd., and Rowland, F. G.—Oil circuit breakers. 12th February, 1952. (707059.)

4225. British Thomson-Houston Co., Ltd.—Apparatus for inserting filament support wires in incandescent lamps and the like. 21st February, 1951. (707399.)

4226. British Thomson-Houston Co., Ltd.—Magnetic amplifier circuits. 21st February, 1951. (707400.)

4354, American Machine & Foundry Co.—Detecting electrically variations in a product and operating a control in response to such detection. 22nd February, 1951. (707238.)

6120. Ateliers de Constructions Electriques de Charleroi.—Manufacture of electron-emissive electrodes for electric discharge tubes. 14th March, 1951. (707241.)

7656. Electric & Musical Industries, Ltd.—Electrode assemblies for cathode-ray tubes. 3rd April, 1952. (707064.)

9871. Rubery, Owen & Co., Ltd.—Control systems for electrically powered fork-lift trucks. 21st January, 1952. (707305.)

10230. Wickman, Ltd.—High frequency electric induction heating. 9th May, 1952. (707071.)

11048. Metropolitan-Vickers Electrical Co., Ltd.—Control of electrically operated mine hoists and the like. 29th April, 1952. (707244.) 11049. Control of mine hoists and the like. 29th April, 1952. (707245.) 11050.—Operation of mine hoists and the like. 29th April, 1952. (707246.)

11695. Trist & Co., Ltd., R.—Magnetic transmissions. 16th May, 1952. (707408.)

13199. Metropolitan-Vickers Electrical Co., Ltd.—Mouldable magnetic materials. 4th June, 1951. (707156.)

14401. English Electric Co., Ltd.—Wind tunnels. 13th June, 1952. (707159.)

15126. Western Electric Co., Inc.—Electrical communication system. 26th June, 1951. (707081.)

15464. Fielden (Electronics), Ltd.—Electrical measuring devices. 30th June, 1952. (707163.)

16446. General Electric Co., Ltd., and Ferguson, H. M.—Directional street lighting fittings. 7th July, 1952. (707166.)

21592. Brookhirst Switchgear, Ltd., and Morrey, C.—Electric switchgear, motor starters, contactors and the like. 19th August, 1952. (707423.)

22010. Moser-Glaser & Co. Akt.-Ges.—Combined current and voltage transformers of the dry type. 19th September, 1951. (707091.)

22825. British Thomson-Houston Co., Ltd.—High-frequency electric discharge devices. 1st October, 1951. (707094.)

23751. Adler, A. E.—Intercommunication telephone systems. 6th October, 1952. (707311.)

24026. Metropolitan-Vickers Electrical Co., Ltd.—Heaters for electron emitters. 13th October, 1952. (707096.)

25548. Babcock & Wilcox, Ltd.—Tubulous vapour generating and superheating units. 1st November, 1951. (707174.)

25746. Scintex. — Automatic electric switches for use on vehicles operable in response to short-circuits. 2nd November, 1951. (707316.)

26343. Thorn Electrical Industries, Ltd.—Luminescent materials. 29th October, 1952. (707101.)

26560. British Thomson-Houston Co., Ltd.—Starting and operating circuits for high pressure gaseous discharge devices. 13th November, 1951. (707318.)

26884. Heinrich, R. F.—Two-stage electrostatic precipitators. 16th November, 1951. (707103.)

27762. Heinrich, D. O.—High tension supply means for electrostatic precipitators. 27th November, 1951. (707106.)

27947. Steatit-Magnesia Akt.-Ges.—Electrical elements and terminal connections therefor. 28th November, 1951. (707177.)

28189. Pinchin, Johnson & Associates, Ltd., Saunders, S. L. M., and Coveney, L. W.—Insulated metal wire and coating compositions for use in the production thereof. 30th November, 1951. (707320.)

29367. Philips Electrical Industries, Ltd.—Luminescent substances. 14th December, 1951. (707110.)

29491. Metropolitan-Vickers Electrical Co., Ltd.—Thermal protective devices for electromagnetic apparatus. 6th November, 1952. (707262.)

1952

71. Metropolitan-Vickers Electrical Co., Ltd.—Magnetometers. 1st January, 1953. (707179.)

1427. Marconi's Wireless Telegraph Co., Ltd.—Circuit arrangements for use with high frequency cables. 3rd October, 1952. (707180.)

2663. Hanovia Chemical & Manufacturing Co.—Electric discharge lamps. 31st January, 1952. (707265.)

2826. Industrial & Financial Association, Inc.—Electrostatic precipitators. 2nd February, 1952. (707266.)

6492. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 25th February, 1953. (707435.)

7039. Adlington, L.—Centrifugal electrical switches. 22nd August, 1952. (707336.)

10784. English Electric Valve Co., Ltd.—Travelling-wave tubes. 5th February, 1953. (707123.)

12110. Burgess Battery Co.—Primary electric cells. 13th May, 1952. (707124.)

12487. Radio Corporation of America.—Photo-conductive targets for cathode-ray devices. 16th May, 1952. (707125.)

13279. Electro-Mecanique de l'Aveyron.—Eddy-current brakes. 26th May, 1952. (707350.)

14587. British Thomson-Houston Co., Ltd.—Regulating systems for the supply of fluid fuel to gas turbines. 10th June, 1952. (707272.)

18213. Standard Telephones & Cables, Ltd.—Valve clipping circuit. 18th July, 1952. (707199.)

22555. Chatham Electronics Corporation.—Control electrode for discharge tube. 8th September, 1952. (707280.)

23572. Western Electric Co., Inc.—Magnetic cores for electrical inductance devices. 19th September, 1952. (707204.)

1953

1592. Automatic Telephone and Electric Co., Ltd.—Electrical switching devices for effecting timed operation. 14th August, 1951. Divided out of 707231. (707288.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Amersham.—20th March. R.D.C. Two centrifugal pumps, electric motors, switchgear, etc., for Little Chalfont drainage scheme. Surveyor, Elmodesham House, High Street.

Australia.—ADELAIDE.—10th March. Electricity Trust of South Australia. Four circulating water pumps complete with motors for turbo-alternators (E.S.B./4078/54. Ten/8422.)*

PERTH, W.A.—25th March. State Electricity Commission of Western Australia. Coal handling plant. (E.S.B./4566/54. Ten/8443.)*

BRISBANE. — State Electricity Commission of Queensland. Tenders for two 7,500 kVA transformers (E.S.B./3106/54. Ten/8267)* should be submitted by 31st March and not 28th April. (Amended date.)

Belfast.—26th March. Electricity Department. L.v. distribution board. (See this issue.) 9th April. Heating and ventilating plant at the West power station. (See this issue.)

16th March. Corporation. Electrical installation at Ardoyne Fire Station, Crumlin Road. Fire Brigade Headquarters, Chichester Street.

Durham.—The Rural District Council is obtaining tenders for the supply of electrical cable and fittings for about 300 houses to be built during the coming financial year. Firms wishing to tender should submit names to the Clerk of the Council, Byland Lodge, Durham, by 13th March.

12th March. County Council. Installation of electricity in four police houses and an office in Ragpath Lane, Stockton-on-Tees. County architect, Court Lane.

Egypt. — CAIRO. — 22nd April. Mechanical and Electrical Department, Ministry of Public Works. H.v. transmission lines and switch stations for feeding transformer stations of the El Deshoudi and other pumping stations. (E.S.B. 4871/54. Ten/8451.)*

Erpingham.—26th March. R.D.C. Filtration and chemical treatment plant; two electrically driven submersible-type borehole pumps, complete with all electric equipment, for the proposed pumping station at Barningham Park, Norfolk. J. C. Mellis & Co., engineers, 110, Horseferry Road, London, S.W.1.

Golborne.—20th March. U.D.C. Electrically driven water booster plant at Houghton Coat, Lowton. J. B. Hoyle, Surveyor, Council Offices, Lowton, near Warrington.

India.—NEW DELHI.—10th March. Meter testing equipment. (E.S.B./4811/54. Ten/8450.)*

12th March. Electric cable. (E.S.B./4812/54. Ten/8456.)*

16th March. Radio test equipment. (E.S.B. 5072/54. Ten/8469.)* Cable. (E.S.B. 5071/54. Ten/8470.)*

BANGALORE.—8th March. Government of Mysore Stores Purchase Committee. Motors and switchgear for Belagular pumping station. (E.S.B./4729/54. Ten/8431.)*

TRIVANDRUM.—17th March. Government of Travancore-Cochin Stores Purchase Committee. Distribution transformers. (E.S.B./4728/54. Ten/8419.)*

Iraq. — BAGDAD. — 20th March. Central Foreign Purchasing Board, Ministry of Finance. Air conditioning apparatus. (E.S.B./4815/54. Ten/8437.)*

Kuwait.—22nd April. Government of Kuwait. 11 kV, 415 V and pilot cables. (See this issue.)

Mullingar.—18th March. Westmeath County Council. Electrical installation at the proposed new county clinic. J. V. Tierney & Co., consulting engineers, 15/16, Duke Street, Dublin.

Newcastle-on-Tyne.—3rd April. Education Committee. Electrical installation in Rutherford Grammar School. 5th April. Electrical installation in North Fawdon County Primary School. City architect (Education Section), 18, Cloth Market.

Nottingham.—19th March. Corporation. Street lighting equipment. (See this issue.)

Philippines.—ESCOLTA, MANILA.—12th March. One 330 h.p. hydraulic turbine, 250 kVA generator and ancillary equipment. (E.S.B./4745/54. Ten/8428.)*

Portglenone (Co. Antrim). — 16th March. Electrical installations at Oliver Plunket Hall. E. J. McErlean, secretary, Oliver Plunket Hall, Clady.

Portugal. — LISBON. — 22nd April. Directorate General of Overseas Development. Electro-mechanical equipment for the Mabubas hydro-electric power station and for a transformer station at Luanda, Portuguese West Africa. (E.S.B./4512/54. Ten/8421.)*

South Africa.—PRETORIA.—The Union Tender Board is preparing a list of approved tenderers for the supply of p.v.c. indoor telephone wire. Firms desirous of being included should apply to the Controller of Post Office Stores, P.O. Box 447. (C.R.E./7995/51. Gen/935A.)*

Uruguay. — MONTEVIDEO. — 25th March. Usinas Electricas y los Telefonos del Estado. Transformer unit and various materials. (E.S.B. 5106/54. Ten/8467.)*

Whitley Bay.—13th March. U.D.C. Electrical installations in 20 houses at Hill Heads Road, E. Roberts, Surveyor, Council Offices.

ORDERS PLACED

Glendale (Northumberland). — R.D.C. Electrical installation in new Council Offices.—J. Tully & Co.

Manchester.—Corporation Highways Committee. Auxiliary equipment for 250 W mercury vapour street lighting.—British Thomson-Houston Co., Ltd.; General Electric Co., Ltd.

Newport (Salop).—U.D.C. Recommended. Electric street lighting on part of the main Wolverhampton-Whitchurch road (£2,262).—Revo Electric Co., Ltd.

Rowley Regis. — Corporation. Recommended. Thirty-nine 80 W mercury discharge lamps on concrete columns at the Tividale Hall estate (£1,545).—Metropolitan Vickers.

Southall. — Corporation. Recommended. Thirty-three street lighting columns and 60 W sodium lanterns at Havelock Road (£1,219).—Erecon, Ltd.

Stockport.—Corporation. Electrical installations in 101 houses at the Brinnington estate (£3,357).—J. S. Morris (Cheadle Heath).

Torquay.—Housing Committee. Recommended. Electrical installation work in 39 houses on the Sherwell Valley estate (£956).—C. M. F. Allwood.

Windsor.—Corporation. Electrical installations in 36 flats at Vale House, Dedworth Road (£1,128).—F. E. Morris (Langley, Bucks).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashton-under-Lyne.—Phase two of College of Further Education; county architect, County Offices, Preston.

Barnsley.—Mining and Technical College extensions (£135,000); Lyons & Israel, architects, 26, Seymour Street, London, W.1.

Bath.—Rebuilding Regina Hotel, Bennett Lane; Gerrard, Taylor & Partners, architects, 3/5, Bridge Street.

Bedford.—Proposed abattoir (£34,000), Barkers Lane; borough engineer.

Dwellings on Putnoe estate; W. J. Bushby, Ltd., Bedford (35), and Gambrell & Sugars, Ltd., Bedford (26).

Bewdley (Worcs.).—Dwellings (106), Springhill estate; J. Herbert Smith (Kidderminster), Ltd., 101, Station Hill, Kidderminster.

Birkenhead.—Houses (32), Prenton Dell estate; Dell Investments, Ltd., Russell Road.

Birmingham. — Factory, Garretts Green; Remploy, Ltd., 25, Buckingham Gate, London, S.W.1.

Bishop Auckland. — Houses (106), Woodhouse Close estate; U.D.C. surveyor, 50, North Bondgate.

Bournemouth.—Police headquarters, Madeira Road; borough architect.

Flats (32), Pinecliff Road; A. J. Seal & Partners, architects, Majestic Chambers, Westover Road.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Bacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Brigg.—Dwellings, Winteringham (50) and East Halton (22) for R.D.C.; Council's architect, Brigg, Lincs.

Brighton.—Remodelling of Corn Exchange, Royal Pavilion estate; borough surveyor, 26–30, King's Road.

Flats (18), shops (6) and garages (4) at corner of St. George's Road and College Road, and police houses (12), at Hollingdean and Craven Vale; borough engineer and surveyor, 26–30, King's Road, Brighton, 1.

Flats (8), at junction of Upper and Lower Bevendean Avenues; A. C. Jenkins, Ltd.

Burnley.—Houses (92), Far Brunshaw estate; Leonard Frankland, Ltd., Blackburn Road, Church, Accrington.

Buxton.—Houses (77), Victoria Park; borough surveyor.

Canterbury.—Bus station (about £40,000); L. H. Wilson, city architect, Municipal Buildings.

Cardiff.—Radiotherapy department at Whitchurch Hospital; Wales Regional Hospital Board, Maesycoed Road.

Carlisle.—Flats and bungalows (300), on scattered sites; city engineer, 18, Fisher Street.

Chesterfield.—Church and hall, Basegreen estate, for C. of E. authorities; J. Mansell Jenkinson & Son, architects, 18, Norfolk Row, Sheffield.

Clay Cross.—Rebuilding of the "Hippodrome" cinema; A. J. Thraves & Son, architects, Whitefriars House, Friar Lane, Nottingham.

Cumberland.—Miners' welfare hall at Siddick for the N.C.B. (£10,000); Gordon Durham & Co., builders, Workington.

Dagenham.—Houses (208), Valentines Way and Eastbrook Drive; Parrish (Builders), Ltd., 137, Billet Lane, Hornchurch.

Doncaster.—Houses for R.D.C. at Askern (24), Edlington (26), and Armthorpe (30); Council's architect, R.D.C. Offices, Doncaster.

Dorchester.—Houses (98), in six parishes; R.D.C. surveyor, 58, High West Street.

Durham.—Nursery school, health centre, clinic and boarding school for the physically handicapped; county architect, Court Lane.

Eastbourne. — Factory, Brampton Road estate; Smith & Ouzman, Ltd., printers and manufacturing stationers, 123, Whitecross Street, Clerkenwell, E.C.1.

East Ham.—Houses, etc. (196), Aldersbrook Road; H. A. Edwards, town clerk, Town Hall, E.6.

Eccles.—Municipal offices, King Street; G. O. Jones, town clerk, Town Hall.

Houses (306), Brookhouse estate; Bower, Moffat & Co., Ltd., 17, Park Street, Manchester.

Fareham.—Shops with living accommodation over, Stow estate; U.D.C. surveyor, Westbury Manor, Fareham, Hants.

Gateshead.—Additions to blocks "Ashwood" and "Beechwood" at Fountain View Institution (£17,000); R. Bowey & Son, builders, Back Raby Street, Newcastle-on-Tyne.

Secondary modern school at Hill Head; borough engineer, Municipal Buildings.

Gravesend.—Infants' school, King's Farm estate; D. Darbison, architect, 36, Earl Street, Maidstone.

Guildford.—Church and hall, Bellfields estate; Hiscock & Duncan Scott, architects, Bridge Street.

Hastings.—Operating theatre for St. Helen's Hospital; B. Stevens & Partners, architects, 49, Havelock Road.

Heanor.—Houses (68), Loscoe estate; U.D.C. surveyor.

Hyde.—Houses (41), Fleet Street; W. H. Matthews, Ltd., 25, Norris Road, Sale, Ches.

Lancaster.—Ward block, Lancaster Moor Hospital; Manchester Regional Hospital Board, Cheetwood Road, Manchester.

Leyland.—Cinema at rear of public hall; Grenfell Baines & Hargreaves, architects, 12, Guildhall Street, Preston.

Llanelly.—Factory; M. Davies & Co., metal merchants, 6, New Zealand Street.

London.—CAMBERWELL.—Houses (130), Pelican Yard (£300,000); town clerk, Town Hall, Peckham Road, S.E.5.

FULHAM.—Three, five and eight storey blocks of flats, North End Crescent; borough housing director.

GREENWICH.—R.C. school, Charlton Road; Clayton & Black & Partners, architects, 10, Baley Street, W.C.1.

LUDGATE CIRCUS.—Shops; Falkus Bros., Ltd., builders, 23, Folgate Street, E.1.

Loughborough.—Church, Park Road, Skelthorpe; Sandy & Norris, architects, 134, Newport Road, Stafford.

Private building estate (commencing with 130 dwellings), Beacon Hill site; Soar Valley Builders, Loughborough, Leics.

Manchester.—Factory, Shady Lane, Wythenshawe, for Brookfield Clothing Co., Ltd.; Frederick Hill, architect, 14, Manchester Road, Bury.

Middlesbrough.—Technical College, laboratories and workshops, Douglas Street; borough architect.

Mitcham.—Factory, Willow Lane; G. A. Cramp & Sons, Ltd., wholesale bookbinders, Eveline Road.

Morecambe.—Congregational church and school, Stuart Avenue; Middleton & Jones, architects, 1 Queen Street, Lancaster.

Newcastle-on-Tyne.—Additions to the College of Art and Industrial Design (£13,000); city architect, 18, Cloth Market.

North Riding.—Junior school at Thornaby (£46,000); J. W. Henderson & Co., builders, Church Road, Stockton-on-Tees.

Oundle and Thrapston.—Additional development of Highfield estate, Woodford; H. G. Kenyon, R.D.C. architect, Council Offices, Midland Road, Thrapston, Kettering.

Portsmouth.—Dairy and offices, Western Road; Portsmouth Dairies, Ltd., 83/93, Duncan Road.

Rickmansworth. — Extensions (£263,750) for Colne Valley Sewage Board, Maple Lodge Works.

Rochester.—Secondary school, Hoo; Lyons & Israel, architects, 26, Seymour Street, W.1.

Rochford.—Factory premises, Municipal Airport; borough engineer, Municipal Offices, Southend-on-Sea.

Salford.—School, Ordsall; Halliday & Agate, architects, 19, John Dalton Street, Manchester.

Extensions to works at Ordsall Lane, for Colgate-Palmolive, Ltd.; Harry S. Fairhurst & Son, architects, 55, Brown Street, Manchester.

School, Pendleton, for R.C. authorities; R. Byrom, architect, 9, Victoria Buildings, Bury.

Slough.—Chest clinic, Upton Hospital; North West Metropolitan Regional Hospital Board, Sheffield Street, London, W.C.2.

South Shields.—Factory additions for Crushing, Screening and Engineering, Ltd.; D. Glen, Ltd., builders, Albert Road, Jarrow-on-Tyne.

South Westmorland.—Houses (81), Milnthorpe, for R.D.C.; Norman Jackson, Gatebeck, nr. Kendal.

Staffordshire.—County primary school on Long Knowle estate, Wednesfield, and youth centre on the Minster Hall Estate, Lichfield; education officer, Education Offices, Green Hall, Lichfield Road, Stafford.

Stockton-on-Tees.—Church, Tinterton Avenue; G. E. Charlewood, architect, 14, Neville Street, Newcastle-on-Tyne.

Sunderland.—Block of shops, Barnes Park Road, for F. B. Hindmarsh & Partners, estate agents, 114, Pilgrim Street, Newcastle-on-Tyne.

Sutton-in-Ashfield. — Erection of Stoneyford Road Secondary Modern School; J. Searson, Ltd., Station Road.

Walthamstow.—Technical school, Billet Road (£120,000); Essex county architect, County Hall, Chelmsford.

Whitehaven.—Fire station and houses at Richmond Hill, Hensinghan; Thos. Armstrong, Ltd., South Street, Cockermouth.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 10th March:—

WETROK. No. 719,421, Class 7. Electrically-operated floor-treatment mochines; not for domestic use; and machines for sanding floors, wringing machines and washing machines.—Müller-Brütch & Co., Zurich, Switzerland. Address for service, c/o Trade Mark Protection Society, 50, Lincoln's Inn Fields, London, W.C.2.

LOCHRIN. No. B721,068, Class 9. Insulated electric wire, fuse wire, and electric cables for use in electric power transmission.—William Bain & Co., Ltd., Lochrin Ironworks, Coatbank Street, Coatbridge, Lanarkshire.

WILINST. No. 724,065, Class 9. Scientific, nautical, surveying and electrical apparatus and instruments, all included in Class 9; radio sets (sold complete); signalling, checking (supervision), life saving and teaching apparatus and instruments; and fire extinguishing apparatus.—Willow Bridge Instruments, Ltd., 2, Craigmuir Park, Wembley, Middx.

RIGHT MONKEY. No. 724,695, Class 9. radio, television, photographic and cinematographic apparatus and instruments; sound recording apparatus and instruments, etc.—Alfred Read, 34, Cavendish Road, St. Annes-on-Sea, Lancs.

EMBASSY. No. 725,120, Class 9. Electronic apparatus and instruments included in Class 9; radio apparatus, television apparatus, etc.—Oriole Records, Ltd., 119, Bishopsgate, London, E.C.2.

FLOW-LINE. No. 725,295, Class 9. Fitted electrical fuseboards.—Dorman & Smith, Ltd., Ordsal Electrical Works, Manchester, 5.

AUTOCAP. No. 725,328, Class 9. Electric accumulators and parts thereof included in Class 9.—Magnatex, Ltd., Harlington Works, Bath Road, Harlington, Middx.

WIREOHMS. No. 702,803, Class 11. Thermo-electric heating elements included in Class 11.—Wireohms, Ltd., Peas Hill Road, Nottingham.